THE BRITISH JOURNAL PHOTOGRAPHIC ALMANAC

AND

Photographer's Daily Companion

WITH WHICH IS INCORPORATED

The Year Book of Photography and Amateurs' Guide

1911.

EDITED BY GEORGE E. BROWN, F.I.C.

JUBILEE ISSUE

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PREFACE.

One feels a special pleasure in offering to the photographic public the fiftieth annual volume of the "British Journal Almanac." The publication of this Jubilee issue reminds one, as it will doubtless remind every reader of these pages, of the important place which photography has attained during this long period in the world's work and play. Its possibilities in both spheres of human activity were fully recognised at the time the first "Almanac" made its appearance, and each year of the half-century which has elapsed since then has witnessed its steady growth as a craft and as a pastime, and in its application to science and industry. The appearance of the fiftieth issue of the "Almanac" may thus be regarded with satisfaction by every photographer as a symbol of the secure position which photography holds among the applied arts.

The leading article this year appropriately takes the form of a review of the past history of the "Almanac" and of those who have guided its career. In obtaining illustrations for this article, I have to thank Mr. J. Hay Taylor for the loan of the portrait of his late father, and the Platinotype Co. for that of Mr. Bedding.

A general acknowledgment of thanks must also be made to many others, who by their suggestions have shown their interest in the "Almanac." To these and to photographers everywhere I would say that, during the interval before the appearance of the next annual volume, any help which it is possible to give in the weekly columns of "The British Journal of Photography" is at the disposal of all.

GEORGE E. BROWN,
Editor.

24, Wellington Street, Strand, London, W.C.
November 1, 1910.

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Publishers of *The British Journal of Photography*,
24, Wellington Street, Strand, W.C.

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OBITUARY OF THE YEAR.

Among those whose deaths have taken place since the publication of the 1910 ALMANAC are :—

Dr. W. J. Russell, F.R.S. (Nov. 12, 1909).
Frank Bishop (Nov. 12, 1909).
H. J. Burton (Aug. 26, 1910).
Dr. John Nicol (Mar. 13, 1910)

DR. W. J. RUSSELL, F.R.S.

Born in 1830, Dr. Russell took his degree at Heidelberg, and was for many years lecturer on chemistry at St. Bartholomew's Hospital. Well known to chemists by his researches on the atomic weights of nickel and cobalt, the estimation of urea, and his report jointly with Sir W. Abney on the "Fading of Water Colours," photographers will remember him best by the work which occupied the later years of his life.

From 1897 to 1908 he published a series of papers dealing with the action of substances of all kinds upon a photographic plate in the dark, a subject upon which nothing was then known. The metals were first investigated and divided into those able to produce a developable image upon a plate in the dark and those which could not do so, the former being arranged in the order of their activity. Dr. Russell showed later that the active metals all formed hydrogen peroxide as a product of their oxidation when a clean surface was exposed to ordinary air. Hydrogen peroxide was found to act with remarkable vigour on a plate, a solution of 1 in 1,000,000 of water being strong enough to affect a plate placed above it for twenty-four hours. Not only this, but the activity was able to pass through media such as gelatine, gutta-percha, celluloid, etc., and, in the case of very thin media, with but little blurring of the picture. Moisture was usually the carrier of the peroxide in these cases, but some volatile substances were able to act in its place, *e.g.*, camphor in the instance of celluloid. Subsequent investigations showed that most organic substances which oxidised in the air acted on a plate in the dark, and in some cases it was possible to prove the production of hydrogen peroxide. The woods, for instance, were all active, and gave a very remarkable series of pictures of great sharpness, the picture in some cases being quite different to that seen with the eye or under the microscope.

Many of the vegetable oils, the terpenes, the resins (but not the true gums), coal, and most fibres of vegetable origin, if unbleached, were all shown to be more or less active. The "fossil" resins were

less active than ordinary resins, amber being only slightly so, and the oldest formed coals, such as cannel, possessed but little activity. Thus, as these natural products become more completely oxidised, they are less able to act on a plate in the dark.

These actions were shown to be chemical, and to have no relation to emanations of the radium type. They were unable to pass through the thinnest glass or lead foil or through mica or aluminium foil of a thickness of 1-1,000 inch; on the other hand, they could be carried along a tube and round corners, were stimulated in an atmosphere of oxygen, and completely prevented from taking place in one of carbon dioxide. A further point of interest was the remarkable increase in activity of many of the organic products when exposed to the sunlight or arc lamp.

It was found to be thus possible to stimulate perfectly inactive printed matter from the seventeenth century so that it gave a distinct picture in the dark; the quantity of unoxidised matter remaining in the printing ink must have been infinitesimal. Amber, the resins, oils, and woods all behaved in this manner, but the metals and coals were not affected by exposure to the light.

Dr. Russell showed that this stimulation was caused by the blue end of the spectrum, and there seems to be but little doubt that oxidation was thus promoted and a supply of hydrogen peroxide formed.

FRANK BISHOP.

Mr. Bishop for many years had occupied a leading position in the photographic trade. His connection with the firm of Messrs. Marion and Co. dated back to nearly fifty years ago. For many years he was a partner in the firm, and its first managing director when the business was converted into a limited company in 1901. Apart from his interest in the ordinary branches of photographic trade, Mr. Bishop interested himself very keenly in the publishing side of photography: he was one of the founders of the Photographic Copyright Union in the year 1893, and retained his active interest in and support of this protective association until the time of his death. It was at the time of the formation of the Union that photographers stood in danger of neglecting their rights in reproductions of their work, and though perhaps their interests are now more actively watched over by the Professional Photographers' Association, the pioneer work in this direction was done by the Copyright Union, and largely by Mr. Bishop. In consequence of ill-health, Mr. Bishop had retired from active management, but he remained a director of Messrs. Marion and Co. up to the time of his death.

H. J. BURTON.

Mr. Burton was for upwards of thirty-five years associated with the Autotype Company, originally as head of the studio department and latterly as technical manager and expert. His connection with photography commenced somewhere in the early sixties or late fifties, and he was operator at the old firm of Maull and Polybank, in the Strand. Later he joined the original Autotype Company,

which was reconstituted in 1874 or 1875, and remained with the firm until his retirement.

Mr. Burton was not only a skilled operator, but in his way a distinguished experimenter. He invented numerous useful and labour-saving appliances in connection with his craft. Amongst others, "Burton's" actinometer for use in carbon printing is one of the best known. He invented the wave bath for the sensitising of wet-collodion plates, and also a very ingenious plate-coating machine.

DR. JOHN NICOL.

Dr. John Nicol had been editor of the "American Amateur Photographer" (now "American Photography") for fourteen years, and was the first editor of the "Beacon," founded in 1889, afterwards changed to the "Photo-Beacon." Dr. Nicol was also a frequent contributor to the "British Journal of Photography" and many other publications.

Among others whose deaths have taken place during the past year are Harry W. Cox, a victim of his own pioneer work with X-rays; Alfred Seaman, for many years a professional photographer in the North of England; W. G. Coote, for over thirty years treasurer of the Manchester Photographic Society; and J. Mudie Thomson, editor of the "South African Photographic Journal."

Among Continental workers whose demise we regret to record are Dr. F. Stolze, a prominent German photographic journalist, and M. L. Turillon, the successor of A. Darlot in the latter's lens-making business.

THE STORY OF THE "BRITISH JOURNAL ALMANAC."

BY THE EDITOR.

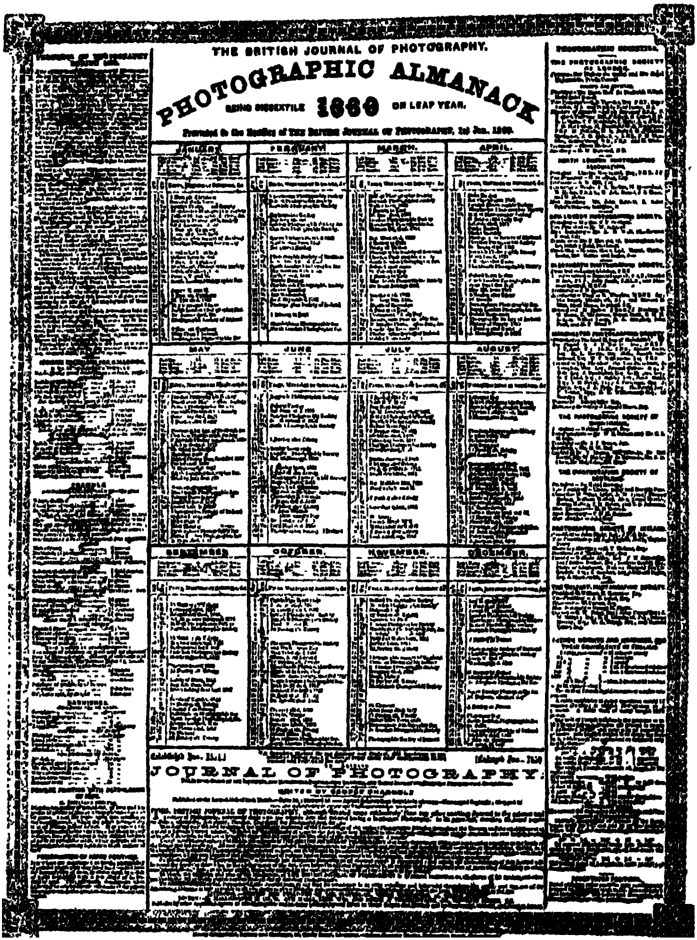
By Way of Preface.

The act of sitting down to write the story of fifty years' publication of the "British Journal Almanac" is one which the writer performs with a good deal of pleasure and with many lively recollections. Notwithstanding any evidence to the contrary which the portrait on another page may supply, it is close on twenty-five years ago since he made the acquaintance of the indispensable "Almanac," and the almost hourly suspense in which its publication was awaited is still as fresh in the memory as many other incidents in the practice of dry-plate photography in the days before everything had been made easy. The "Almanac," therefore, has for its historian a reader and subscriber who has diligently studied its pages for nearly half the period of its life, and has watched a row of green-bound volumes gradually lengthening as issue after issue has marked the years. Perhaps of late the routine of seeing the volume through the press has somewhat dulled the edge of expectation with which the present writer has awaited the first complete copy coming into his hands. But he would still assure his readers that while he continues to prepare its pages no occupation can afford him the same pleasure and interest as this, by which he is brought into friendly communication with photographic workers in all parts of the world.

The First Almanac.

Among many persons who think they possess a set of the "Almanac" from the first issue there is a belief that the original form was that of a volume of waistcoat-pocket size. In point of fact, the first issue was a large sheet intended to be nailed to the wall—a publication after the style of one issued by the "British Workman," in which habits of sobriety and other respectable virtues were conveyed to the mind of youth by suitable woodcut illustrations. The first "Almanac" was announced in the "British Journal of Photography" for December 15 of the year 1859

as follows:—"With our next issue we shall present with each copy a Photographic Sheet Almanac, containing the days of meeting of


THE BRITISH JOURNAL OF PHOTOGRAPHY.

PHOTOGRAPHIC ALMANACK

BEING BISSEXTILE 1860 OR LEAP YEAR.

JANUARY. FEBRUARY. MARCH. APRIL.

MAY. JUNE. JULY. AUGUST.

SEPTEMBER. OCTOBER. NOVEMBER. DECEMBER.

JOURNAL OF PHOTOGRAPHY.

THE FIRST ALMANAC—REPRODUCED FROM THE COPY IN THE BRITISH MUSEUM

all the established photographic societies in convenient form for reference by the members of each, together with sundry other useful

information." This supplement appeared on January 1, 1860. From the reproduction of the only copy known to us—that in the British Museum—it will be seen that "all the photographic societies" number nine, headed by the Photographic Society of London, now the Royal Photographic Society

This first "Almanac," meagre as its literary contents are, yet included features which have grown with the years, and now occupy scores of pages in the present edition. Under "Progress of Photography during 1859" appear references to the technical advances of the year. This first résumé of the technical photographic work of the year runs as follows:—

"The chief feature in the progress of photography during the past year consists in the toning of positive proofs. A formula proposed for that purpose by Mr. Maxwell Lyte has been generally adopted. As the proofs are toned by gold before being submitted to the action of the hyposulphite of soda, their permanency is well assured if proper precautions be used. Toning by chloride of platinum has been strongly recommended by some operators, and, as it is alleged to be more economical than chloride of gold, it is worth the attention of photographers. The proofs toned with chloride of platinum are sometimes a little colder in tone than those toned by chloride of gold, but not objectionably so.

"Carbon printing has excited a good share of interest; and although the results already obtained are very excellent, the processes are not yet so perfect as to cause carbon printing to supersede the usual nitrate of silver process. In fact, this latter appears to resist every attempt made to overthrow its dominion.

"The lens controversy has somewhat subsided. Petzval and Voigtländer have not settled their differences. Other lenses, differing in construction from those which caused so much excitement, have been introduced to the notice of photographers; and lately Mr. Sutton has patented a lens constructed on a formula for which he claims the merit of originality.

"Dry processes are the great desiderata for out-of-door photographers; they have now attained to so great perfection there is little left to be desired.

"The exhibitions show no falling-off in variety and excellence. On the contrary, unlooked-for perfection is observable in the artistic treatment of subjects. This branch of the photographic art is becoming better understood and appreciated, and in every class of subject we have photographs which are, in every sense of the word, pictures.

"In stereographs we have observed remarkable improvements, and they may now be considered to have approached towards perfection.

"Collodion.—The solvent of cellulose having been discovered by Schweitzer, Leon Kraft has broached the idea of applying it to making collodion.

"In the waxed paper process we have to note the application of paraffin and belmontine oils as solvents for wax; the results are very satisfactory, and it is probable that this process will gain a

new impetus by the attention the employment of these substances has awakened.

"At the meeting of the British Association, held at Aberdeen, photography was eminently conspicuous. In celestial photography Mr. Warren de la Rue made a very interesting and important communication, and Messrs. Maskelyne, Hadow, Hardwich, and Llewellyn presented their report on the nature of the photographic image. Photography has to mourn the loss of a name which has become inseparably associated with it—Mr. Andrew Ross, the skilful optician."

The size of this wall "Almanac" so cuts it off from the issues in book form which succeeded it that, in the present celebration of the jubilee of their publication, the publishers, Messrs. Henry Greenwood and Co., with innate modesty, have taken the 1861 edition as the first of the series, yet had they been so disposed they might quite legitimately have chosen the 1910 volume as the one to be marked "Jubilee."

THE "ALMANACS" FROM 1861 TO 1865.

Commencing with 1861 the form of the "Almanac" was changed to a pocket volume, which was presented to subscribers of the "British Journal of Photography" with the first issue in each of these years. The "British Journal" at that time was edited by Mr. George Shadbolt, the most able and scholarly of the occupants of the editorial chair. Under his direction from 1857 to 1864 the reputation of the "B.J." as the organ of scientific photography was practically created, and his withdrawal from photographic journalism might have been a serious blow to the then struggling publication had a less able successor than J. Traill Taylor been appointed. But during Shadbolt's editorship of the "Journal" the "Almanac" was placed successively in the hands of Samuel Highley, James Martin, and Emerson J. Reynolds. In 1865, when Traill Taylor assumed the reins of office the two publications henceforth appeared under the one direction.

THE FIRST EDITORS.

Of the first three editors of the "Almanac" one still survives in the person of Mr. James Martin. He joined the staff of the "Journal" in 1863 as assistant to Shadbolt, and was for many years connected with it in various journalistic capacities. A pharmacist by training, Mr. Martin was possessed of a store of the scientific knowledge of his day, and was the author of a number of manuals on popular and mechanical science.

Samuel Highley, at the time of his death, which took place ten years ago, had long passed out of the recollection of photographers, save only of a few co-workers, among whom are Sir William Crookes and Mr. John Spiller. But for nearly forty years he was an assistant editor of the "Journal." His scientific bent found expression in photography, mineralogy, and microscopy. His interest in the use of the optical lantern for scientific purposes led him to write a series of articles on the subject. Both Mr. Highley and his old friend and colleague on the "B.J.," George Dawson,

ended their days in the Charterhouse, that last home of many a distinguished man, of which Thackeray has drawn so pathetic a picture in the "The Newcomes."

Dr. Emerson J. Reynolds, who for one year is named as the editor of the "Almanac," was at that time lecturer on chemistry in the Ledwich School of Medicine and Surgery, Dublin, afterwards becoming professor of chemistry to the Royal Dublin Society.

J. Traill Taylor.

Apparently none of these gentlemen took steps to modify the character of the "Almanac" in any way. It is evident that each was called upon to supervise the production of a little book which was given away without charge, and, therefore, for obvious reasons, would not admit of much application of journalistic enterprise. With the accession of Traill Taylor in 1865 all this was speedily changed. Under his direction the "Almanac," like the "Journal," gradually grew to the important position which it now occupies in photographic publishing. With the exception of an interregnum of seven years, during an absence in America, Traill Taylor conducted the weekly and annual publications until his death in 1895, and no account of the progress of the "Almanac" can easily exaggerate the authority and ability with which the technical side of photography was advanced through his editorial labours.

Of Traill Taylor's life we must content ourselves by quoting the following from the jubilee issue of the "British Journal" of June 10, 1904:—"John Traill Taylor was born at Kirkwall, in the Orkneys, on January 23, 1827. As a youth he was attracted to and practised the daguerreotype process, and, in the intervals snatched from the pursuit of his profession as a watchmaker, developed great aptitude for the study of the chemistry and optics of the then very young art of photography. He was frequently heard to remark that in those days there were no photographic papers to help a young photographer out of his difficulties, and that of the optics of photography, a field in which he was subsequently destined to gain considerable prominence, it was difficult, if not impossible, to acquire knowledge from others.

"A long residence in Edinburgh was the means of bringing Mr. Taylor into contact with Sir David Brewster, Henry Fox Talbot, Mungo Ponton, Piazzi Smyth, R. H. Bow, Thomas Davidson (the optician), and other noted workers of fifty years ago, by whom he was highly esteemed for his knowledge of photography and his abilities as an experimentalist and writer. For some time he was on the staff of the 'Scotsman' and other Scottish newspapers, and dated his first association with photographic journalism from about the year 1856, when he established an ever-circulator magazine devoted to photography, and called the 'Photographer,' many extracts from which will be found in the earlier volumes of 'Photographic Notes,' edited by Thomas Sutton, B.A., between whom and our late friend a warm regard subsequently sprang up.

"Some of Mr. Taylor's optical writings were published in book form a few years ago, but they are not fully representative either of the extent or the depth of his knowledge of the subject. But,

. . The Story of the . .

"British Journal Almanac."

SOME PORTRAITS.

James Martin,
Editor, 1863

Emerson J. Reynolds,
Editor, 1864

J. Traill Taylor,
Editor, 1865 to 1879 and 1887 to 1895

W. B. Bolton,
Editor, 1880 to 1886.

Thomas Bedding,
Editor, 1897 to 1905.

John Birtles,
Advertisement and General Business Manager, 1885 to 1898.

Henry Greenwood,
Founder and Original Proprietor of the "Almanac."

GEORGE E. BROWN, Editor, 1906-

[*Photograph by Brighams, Scarborough.*

ALFRED W. BROOKS,
Advertisement and General Business Manager, 1902–

[*Photograph by Brighams, Scarborough.*

happily, it is not necessary for us, in dwelling upon the vast store of his photographic knowledge and experience, the directness and simplicity of his literary style, and his sagacity as an editor, to do so specifically or in detail—the volumes of the 'Journal' and the 'Almanac,' for over one-third of a century, eloquently tell the story of his life's work, and constitute what we know he himself would regard as his best, most enduring, and proudest memorial."

With the issue for 1866 the "Almanac" assumed its present size and familiar cover of yellow paper or green cloth, a dress which it has retained for the past forty-five years. In this issue the commercial announcements first assume a prominent place. In the case of many of the firms the very names appearing have long since been forgotten, but it is interesting to note a few which still retain a leading place in the photographic trade of to-day:—Harvey Reynolds and Co. (now Reynolds and Branson), Leeds; Ross, London; Mawson and Swan, Newcastle; Claudet, Houghton, and Son (now Houghtons, Limited), London; Newton, Fallowfield, and Thomas, all in London.

The "Almanac" Leading Articles.

In the following year (1867) the feature of an article by the editor on a topic of the year was inaugurated by Traill Taylor in the shape of a chapter for beginners on negative-making and on printing and enlarging processes. This custom has been retained, without omission, to the present time, and as many of these articles were of great practical value at the time they were written, for that very reason the series, or rather the earlier members of it, possess considerable historical interest. The following is a complete list of these editorial contributions, the bracketted letters after each title being the initials of the editor-author:—

1867. "Manipulation and Processes." (J. T. T.)
1868. "Photographic Encyclopædia." (J. T. T.)
1869. "Miscellanea: The Photo Magic Lantern—Photographic Poisons and their Antidotes—View Meters—Enlarged Carbon Prints. (J. T. T.)
1870. "Photographic Optics and Lenses." (J. T. T.)
1871. "Photographic Lenses and the Optics of Photography." (J. T. T.)
1872. "Graphocopes: How to improve the Large Lenses, with other Notes on Photographic Optics." (J. T. T.)
1873. "Lessons in Photography: Wet Collodion—Albumen Printing—Dry Collodion Processes—Enlargements—Carbon Printing—Enamelled Prints—Alabastrine Pictures—Lenses." (J. T. T.)
1874. "Cameras, Ancient and Modern." (J. T. T.)
1875. "Gelatino-Bromide: Its Preparation and Capabilities." (J. T. T.)
1876. "Phototypography, Photolithography, and Photo-Engraving." (J. T. T.)
1877. "Optics of the Magic Lantern." (J. T. T.)
1878. "The Modern Practice of Enlarging." (J. T. T.)

1879. 'The Rise and Progress of Collodion Emulsion Photography." (J. T. T.)
1880. 'The Rise and Progress of Gelatine Emulsion Photography." (W. B. B.)
1881. 'The Boiling Method of Emulsification in Theory and Practice." (W. B. B.)
1882. 'The Comparative Sensitiveness of the Silver Haloids in Gelatine Emulsion." (W. B. B.)
1883. 'Practical Dry-Plate Making." (W. B. B.)
1884. 'Lantern Slides." (W. B. B.)
1885. 'Alkaline Development." (W. B. B.)
1886. 'Film Photography." (W. B. B.)
1887. 'Stereoscopic Photography." (J. T. T.)
1888. 'Enlarging Photographs." (J. T. T.)
1889. 'Iron Printing." (J. T. T.)
1890. 'Focussing: Distortion and Stereography." (J. T. T.)
1891. 'Lanterniana." (J. T. T.)
1892. 'Photographic Panoramas and the Means of Making Them." (J. T. T.)
1893. 'Some Photographic Methods of Book Illustration." (J. T. T.)
1894. 'Micro-Stereography." (J. T. T.)
1895. 'By-Paths of Stereoscopic Photography." (J. T. T.)
1896. 'Miscellanea on the Cognates of Photographic Optics." (J. T. T.)
1897. 'Modern Photographic Lenses." (T. B.)
1898. 'Animated Photography." (T. B.)
1899. 'Chapters on Colour Photography." (T. B.)
1900. 'Stereoscopic Photography." (T. B.)
1901. 'Exposure Tables and Exposure Meters." (T. B.
1902. 'Introductory Notes on Tele-Photography." (T. B.)
1903. 'Chapters on Photo-Micrography." (T. B.)
1904. 'Some By-Paths of Photographic Printing." (T. B.)
1905. 'The Present and Future Position of Photography. (T. B.)
1906. 'Photographic Copyright." (G.E.B.)
1907. 'Three-Colour Photographic Printing Processes." (G.E.B.)
1908. 'Screen-Plate Processes of Colour Photography." (G.E.B.)
1909. 'Reflex Cameras." (G.E.B.)
1910. 'Lens Calculations by Mental Arithmetic." (G.E.B.

W. B. Bolton.

W. B. Bolton assumed the editorial direction of the "Journal" and the "Almanac" in January, 1879, and controlled the destinies of both publications until Traill Taylor's return at the end of 1885. One of the most able experimenters and writers associated with photography, Bolton will be remembered first by his share in the discovery by B. J. Sayce and himself of the method of emulsifying the silver salts in collodion—the process which obviated the employment of the sensitising silver bath. This was in the year 1864. Ten years later Bolton published his method of washed-collodion emulsion, which was a further great step in advance of the previous process in which the bye-products of the formation of the silver

haloids were left in the emulsion. Bolton was thus fully equipped by his early work to enter into the new field of the gelatine process, and his many papers on dry-plate emulsion-making, during his occupancy of the editorial chair, did much to advance the work of experimenters in this country and America. Bolton retained an active association with the "Journal" until his death in May, 1899, retaining his intellectual vigour throughout a most painful illness.

Thomas Bedding.

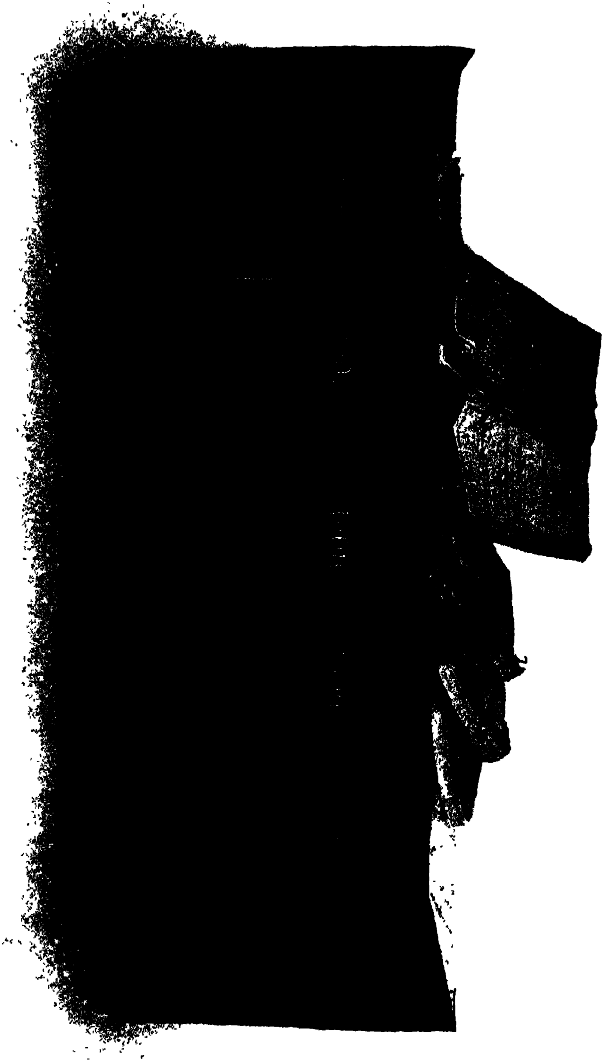
On his death in 1895, nine years after his return to England, Traill Taylor was succeeded as editor-in-chief of the "Journal" and "Almanac" by Thomas Bedding, who, for four years prior to his appointment, had acted as assistant to his predecessor.

The "Almanac" during his tenure of office steadily increased in popularity with the growth of amateur photography as a hobby. In 1903 the edition was raised from 20,000 to 25,000, at which figure the demand for the entire issue becomes keener year by year. Mr. Bedding withdrew from association with the "British Journal" at the end of 1904, and is now engaged in journalistic work in the United States.

George E. Brown.

While thus recording the history of the "Almanac," the present editor is dealing with only the sixth issue which it has been his privilege to superintend, yet during these years it has been considered necessary to make certain reforms in the composition of the letterpress in order to bring the volume more closely into correspondence with the wants of its readers. The most notable of these, perhaps, has been the discontinuance of the promiscuous contributions which, almost since the earliest days of the annual, have been a prominent feature. *Autres temps autres mœurs.* Whilst photography was essentially a scientific craft, and particularly while it was passing through such epochs as the transition from wet-plate to the dry-plate process, the contributions from experimenters formed one of its most valuable features. If one turns back through twenty, or even fifteen, years, one finds in this section articles from the acknowledged leaders in the several branches of photographic technique. A list of those who have thus given away the fruits of their experience includes the names of practically everyone of eminence in photography, and many of these papers will remain the classics of photographic knowledge, a storehouse of facts in which the present experimenter and patentee would be well advised to search before he proclaims himself the discoverer of things new. But with the reduction of photography to a simpler order of operations the incentive to and necessity for such contributions alike disappeared. Only the goodwill of the contributors remained, and this was often taxed by the editorial request for an article dealing with some practical topic of the year. Many readers have doubtless agreed with the present editor in recognising that this section had outlived its usefulness and importance. In place of it the section "Epitome of Progress" has been developed in systematic fashion so as to provide a far more comprehensive review of the work of the year. The "Epitome," as now prepared, represents the

THE OLD AND THE NEW—THE LAST FIVE ISSUES OF THE "ALMANAC" PHOTOGRAPHED WITH THOSE FOR THE YEARS 1861-1865



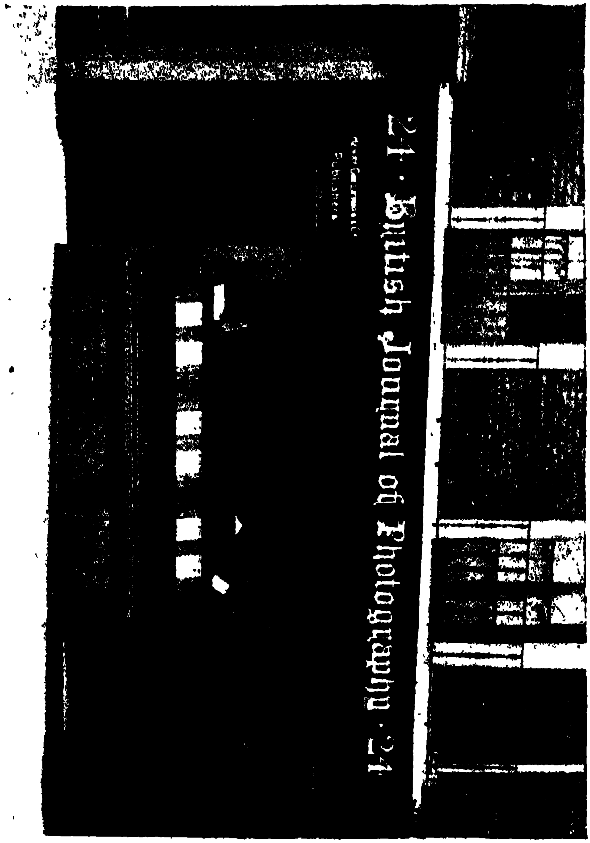
AFTER FIFTY YEARS—THE PHOTOGRAPH SHOWS THE FIRST FIVE AND LAST FIVE ISSUES OF THE "ALMANAC."

work, not merely of a few friendly workers, but of the whole body of those experimenters whose results gain publication in the British and foreign journals. That, after all, is a chief duty which the "Almanac" should discharge to its readers, and has long been recognised as such. In the issue of 1872 it is interesting to note a contributor (the late Mr. A. Pumphery) writing of the "Almanac" that it is "intended to contain the improvements which each photographer has made his own by practice and experience during the year. For myself, I know that, in considering any modifications of processes in work that are needed, I am apt to turn over the leaves of the 'Almanac' for suggestions in the directions desired." Only, with the "Epitome" as at present arranged, it is hoped that much turning over of pages is not necessary. This précis of the year's work follows a definite order according to which everything on a given subject is brought into one place, whilst it is believed that those who are unable to see eye to eye with the editor as regards this plan find in the index a ready means of turning to the information they seek.

The Commercial Direction.

Thus far in our story we have neglected to refer to the importance which the "Almanac" has attained as a medium of publicity among photographers in all parts of the world. Its supreme position in this respect has been a matter of steady growth. Processes have come and gone, firms have risen and disappeared, but for fifty years past photographers in every part of the globe have turned to the "Almanac" for particulars of commercial articles as well as for technical information. The unique place which the "Almanac" thus occupies among photographic publications is universally recognised by the photographic trade, not in this country only, but in America and the Colonies, a fact which is evidenced by the large number of commercial announcements which figure in every issue. In the administration of this important department, the "Almanac" again has been fortunate in its officers. The original proprietor, Mr. Henry Greenwood, himself supervised the business side with solicitous care. On his death in 1884 the commercial direction was continued under John Birtles, who for many years previously had been Mr. Greenwood's right hand. Mr. Birtles occupied this position until his retirement in 1898. He was succeeded by A. E. Dean, who resigned his position early in 1901 on taking up other journalistic ventures. The present manager of the "Almanac" and the "Journal," though actually the member of the staff with the greatest number of years of service to his credit, is still of an age at which he may have reasonable expectation of seeing the centenary of the "Almanac," even if he may not be actively engaged on it. Alfred W. Brooks, whose portrait we reproduce on another page, represents the power which pushes the "Almanac" through the stages of advertisement—arrangement, composing, printing, binding, and shipping for publication throughout Europe on December 1, and in most parts of the world early in the New Year. It is a common idea among those outside of the publishing trade that an advertisement manager's day is spent in accepting

orders which flow in spontaneously. The fact, of course, is that even the keenest and most enthusiastic advertisers experience about the same pleasure in sending in "copy" that a child has in being dressed of a morning, and thus during the three months prior to



The publishing offices of Henry Greenwood and Co., at 24, Wellington Street, Strand, W.C., where for the past thirteen years the "British Journal Almanac" and "British Journal of Photography" have been edited and published.

the appearance of the "B. J. A.," the manager's life is an incessant effort to complete the thousand odd pages and to see the edition of 25,000 copies (representing 30 tons of paper and board) distributed on scheduled time.

EPITOME OF PROGRESS.

BY THE EDITOR.

In the following pages will be found classified abstracts of papers, communications, and articles describing progress in technical photography (art topics are excluded) which have appeared in the British and foreign Press during the twelve months Oct. 20, 1909, to Oct. 20, 1910. It may have happened that some foreign journals have not arrived in time for abstraction; their contents will be dealt with in the 1912 "Almanac."

The general arrangement of the Epitome will be seen from the contents of the "Almanac," which follows the title-page. Each item is separately entered in the index at the end of the volume, and a list of the journals abstracted will be found at the conclusion of the Epitome.

In a number of cases where information additional to that in the abstract has appeared in the "British Journal of Photography" a reference to issue and page has been given.

I.—GENERAL.

EVENTS OF THE YEAR.

1909.

Nov. 2 to Dec. 18, 1909.—Exhibition of photographs by Arthur Marshall at the R.P.S. 1910 ("B.J.," Nov. 12, 1909, p. 878).

Jan. 11, 1910.—Award of the Progress Medal of the Royal Photographic Society to Alfred Watkins for his work in exposure and development. A portrait of Mr. Watkins and a review of his work appear in "B.J.," Jan. 14, 1910, p. 20.

Jan. 29 to Feb. 19.—Seventh Scottish Salon. Held at Dundee. ("B.J.," Feb. 4, 1910, p. 82.)

Feb. 10 to 26.—Exhibition of Rapid Bromide Printing Machines and other printing appliances at the office of the "British Journal." ("B.J.," Feb. 11, 1910, p. 95.)

Feb. 22 to March 26.—Exhibition of photographs by Alex. Keighley at the Royal Photographic Society. ("B.J.," Feb. 25, 1910, p. 144.)

March 2.—Meeting held on the initiative of the Survey and Record of Survey to form a federation of photographic record societies. ("B.J.," March 11, 1910, p. 171.) The official formation of the Association, with Sir Benjamin Stone as president, is reported in "B.J.," June 10, 1910, where the rules are given.

April 5 to May 28.—Exhibition of photographs by E. O. Hoppé at the R.P.S. (See "B.J.," April 8, 1910, p. 267.)

April 9 to 16.—Photographic Arts and Crafts Exhibition, organised by Arthur C. Brookes, at the Horticultural Hall, Westminster. ("B.J.," April 15, 1910, p. 289.)

April 11 to 15.—First Congress of the Professional Photographers' Association, held at the Horticultural Hall, Westminster, under the presidency of William Gill. The proceedings are reported in the "B.J." for April 15 and 22. A reproduction of a group of members appears as a supplement to the "B.J." for April 29, 1910.

April 14 to May 12.—Exhibition of photographs by A. L. Coburn and Baron de Meyer at the Goupil Gallery. ("B.J.," April 22, 1910, p. 311.)

May 27, 1910.—Formal dissolution of the National Photographic Record Association. ("B.J.," June 3, 1910, p. 418.)

June 15 to July 30.—Second exhibition of oil prints by R. Demachy at the Royal Photographic Society. ("B.J.," June 17, 1910, p. 461.)

June 20 to July 9.—Third exhibition of the Society of Colour Photographers. Held at the "British Journal" offices. ("B.J.," June 24, 1910, p. 471.)

July 4 to 9.—Twenty-fifth meeting of the Photographic Convention of the United Kingdom. Held at Scarborough under the presidency of Godfrey Bingley. The proceedings are reported in "B.J." for July 8 and 15, 1910. The 1911 meeting will be held at Exeter under the presidency of J. B. B. Wellington.

Aug. 1 to 6.—Fifth International Congress of Photography. Held at Brussels. The chief papers read before the Congress, with notes thereon, appear in "B.J.," Aug. 12, 19, 26, and Sept. 2 and 9, 1910. The next Congress will be held in 1915 in London.

Aug. 20 to Sept. 16.—Fifty-fifth exhibition of the Royal Photographic Society. Held at 5a, Pall Mall East. ("B.J.," Aug. 26, p. 614, and Sept. 2, p. 670, 1910.) Selecting and Hanging Committees:—Pictorial section: A. H. Blake, Harold Holcroft, E. T. Holding, C. F. Inston, Alex. Keighley, Furley Lewis, and Arthur Marshall. Colour section: H. G. Drake-Brockman, Ernest Marriage, and H. T. Malby. Natural history section: Douglas English, E. Kay Robinson, W. Farren, and R. Kearton. Scientific section: W. D. Butcher, C. P. Butler, F. Martin Duncan, C. E. K. Mees, A. J. Newton, and Major General J. Waterhouse.

Sept. 2 to Oct. 7.—First Exhibition of the London Salon of Photography. Held at 148, New Bond Street, W. ("B.J.," Sept. 9, 1910, p. 679.) The management of the exhibition is stated to be in the hands of the British members, whose names are as follows:—J. H. Anderson, E. R. Ashton, A. H. Blake, Carine and Will A. Cadby, Reginald Craigie, C. H. L. Emanuel, Frederick H. Evans, E. O. Hoppé, Chas. Job, Alex. Keighley, Arthur Marshall, F. J. Mortimer, Ward Muir, Frank H. Read, H. Snowden Ward, and J. B. B. Wellington.

1911.

March 3 to 18, 1911 (announced).—Northern Photographic Exhibition in the Walker Art Gallery, Liverpool.

BUSINESS.

Press Photography.—An action of some importance to Press photographers was brought in the City of London Court on July 14, 1910, by the "Daily Express" against Messrs. Dixon and Co. One hundred pounds damages were claimed for the alleged fraudulent supply to the "Express" of a print purporting to be a photograph of the arrival of the aeronaut, M. Lesseps, at Dover, which, to the knowledge of Messrs. Dixon, was a made-up picture which did not actually represent the scene. Messrs. Dixon admitted that as the distance of the aeronaut did not admit of his inclusion in the picture they printed in an aeroplane of the same type, and the result was a true representation of the scene. The "Express argued that a line should have surrounded the aeroplane as an indication that it was not visible in the camera exposure. The judge held that there had been no fraud and no damage, and he, therefore, gave judgment for defendants with costs. He said that had the plaintiffs brought an action for breach of warranty they might have succeeded. To send in a photograph as defendants had done without qualification amounted to a warranty, and for breach of such warranty the plaintiffs would, doubtless, have been able to obtain nominal damages and probably costs.—"B. J.," July 22, 1910, p. 559.

The Dry Mounting Patent.—In the Chancery Division of the High Courts on March 22, 1910, Mr. Justice Parker delivered judgment in the action brought by the Adhesive Dry Mounting Company against L. Trapp and Company for infringement of the Derepas patent of dry mounting by means of shellac. The judge held that the action failed on the ground of anticipation of the invention as described in the specification of Dobler in 1895, and of Jeyes in 1867. The report of the evidence heard and of the full judgment is given in "B. J.," March 11, p. 177, and April 1, p. 247, 1910.

The P.O.P. Formula Fraud.—In the London Sheriff's Court on December 8, 1909, judgment by default and £100 damages were given against H. Macfarlane (Arthur Campbell), who was sued by Wilfred Brandes in reference to the purchase from Macfarlane of a formula for making P.O.P. Brandes had spent altogether

£120, but the business had proved valueless.—"B. J.," Dec. 17, 1909, p. 973.

Portrait Coupons.—L. Haweis has dealt at some length with the methods of applying the coupon system in commercial portrait photography. He gives examples of coupons specially worded to protect the photographer from the agent.—"B.J.," Oct. 15, p. 797, and Oct. 22, p. 816, 1909.

Carl Zeiss, Limited.—Registered in England as a limited company with a capital of £10,000, with works at Bittacy Hill, Middlesex.—"B.J.," Nov. 12, 1909, p. 884.

Ilford, Limited.—At the annual general meeting of Ilford, Limited, the chairman addressed the shareholders on the improved condition of the company, and the directors' recommendation of a 6 per cent. dividend was adopted.—"B.J.," Dec. 17, 1909, p. 972.

Eastman Kodak Co.—The report of the year's trading of the company, ending December 31, 1909, records a net profit of £1,412,902, as against £1,334,540 for the previous twelve months.—"B.J.," Apr. 22, 1910, p. 310.

WEIGHTS AND MEASURES.

Rapid Calculations.—The following rules allow of calculations of weights and measures, etc., being rapidly made on the percentage system, as largely used for commercial purposes.

	WEIGHTS.	ERROR.
Grains to grammes:	Take 6 per cent. and increase it by 8 per cent.	−0·0000064
Grammes to grains:	Multiply by 15, then increase result by 3 per cent.	+0·00115
Ounces to grammes:	Multiply by 28, then increase result by 1¼ per cent.	−0·00009
Grammes to ounces:	Take 3 p.c. and increase it by ⅙ + (5 p.c. of ⅙)	−0·00066
Pounds to kilos:	Take 40 p.c. and increase it by 10 p.c. + (⅓ of 10 p.c.)	−0·00047
Kilos to pounds:	Multiply by 2, then increase result by 10 p.c. + (2 per cent. of 10 per cent.)	−0·00028
	LENGTHS.	
Inches to centimetres:	Multiply by 2, then increase result by 25 p.c. + (8 per cent. of 25 per cent.)	−0·000032
Centimetres to inches:	Take 40 per cent. and diminish it by 1½ p.c.	+0·001
Yards to metres.	Take 70 per cent. and increase it by 30 p.c. + (2 per cent. of 30 per cent.)	−0·0002
Metres to yards:	Add 9 per cent. and 4 per cent of 9 per cent.	−0·00001
	FLUID MEASURES.	
Pints to litres:	Take 40 per cent. and increase it by 40 p.c. + (5 per cent. of 40 per cent.)	−0·0004
Litres to pints:	Multiply by 2 and diminish result by 12 p.c.	+0·000032
	PLATE SPEED NUMBERS.	
Watkins to H. and D.:	Take 68 per cent.	
H. and D. to Watkins:	Add 50 per cent. and diminish result by 2 p.c.	
	THERMOMETER SCALES.	
Fahrenheit to Centigrade:	Deduct 32 deg., then take 50 per cent. and increase it by 10 per cent. *ad lib.*	
Centigrade to Fahrenheit:	Multiply by 2 and then diminish result by 10 per cent. Add 32 deg.	

The rules are given in full in the table, so that the method of application may be clear, but when the general principle of each is understood the rules may, of course, be noted down much

35*

more briefly. Thus the rule for converting pounds to kilos could be stated as 40 per cent. + 10 per cent. + 33⅓ per cent.

All the percentages are very easy to write down. Thus for 1¼ per cent. we divide by 80, which means that we divide by 8 and shift the decimal point one place to the left. For 5 per cent. we divide by 2 and shift the point one place. 50 per cent. and 25 per cent. are, of course, ½ and ¼ respectively. For 30, 40, or 70 per cent. we simply multiply by 3, 4, or 7, and shift the point to the left for one place. For 10 per cent. we shift the point one place, and for 1 per cent. two places. For 1½ per cent. we shift the point two places and add half the number. For other percentages we simply shift the point two places and multiply out. As the results always have to be added, we do not actually shift the point itself to the left, but write down the figures one or two spaces to the right, as the case may be.—"B.J.," Apr. 29, 1910, p. 319.

II.—APPARATUS AND EQUIPMENT.

(Including Raw Materials Used in Photography.)

The many details of pieces of apparatus published chiefly in patent specifications are not abstracted in this Epitome, as space does not permit of the numerous drawings necessary for their explanation. All patent specifications are abstracted in the "British Journal of Photography," and are entered according to subject and also under the name of the patentees in the index to the yearly volume of that publication, which is issued with the last number of the year or the first of the year following.

Dark Room and Studio.

Covering for Work Benches.—Where the expense of a hard wood top to the working bench is an objection no better covering for lasting wear can be found than hard well-seasoned linoleum costing three or four shillings per yard. The inlaid Greenwich linoleum is usually very hard, though a plain brown or green looks better. It should be tacked down all round the edges with gimp pins, and can be wiped over with a cloth and made perfectly clean in a moment.

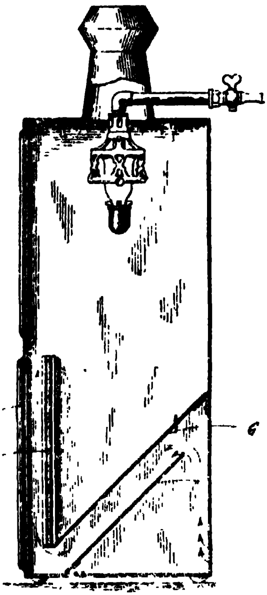
When it can be afforded a top of teak or oak is the best, and is kept in good condition by rubbing boiled linseed oil occasionally into it.—"B.J.," Oct. 15, 1909, p. 793.

Blacks for Wood and Metal.—A most useful varnish for all kinds of surface is that made by dissolving celluloid in amyl-acetate or purchasing such celluloid varnish. It is diluted as directed below until of a suitable consistency, and lamp-black then added, but the lamp-black should be that obtained from the artists' dealer, not from the oil shop.

For a dead black varnish the celluloid syrup is diluted with acetone until of suitable consistency for use with a camel's hair brush. Lamp-black is then added to the mixture in quantity sufficient to give a dead surface. Generally it is best to give a second coat after the first one is dry. A dead result is obtained on either wood or metal.

If the syrup be diluted with amyl-acetate instead of acetone a black finish (not dead) is given to wood or metal. The surface on

being rubbed up with a bit of felt gives a semi-glossy finish.—"Photo-Notes," Jan., 1910, p. 5; "B.J.," Jan. 28, 1910, p. 67.



Dark-room Lamp.—S. H. Wratten has patented a construction of dark-room lamp in which the current of air required for the illuminant enters along a passage and passes between the safe-light and a sheet of glass before reaching the burner, thus keeping the safe-light cool. In the figure, *E* is the safe-light supported in the front frame of the lamp; *G H* is a double partition in the casing forming a channel for the entrance of air; *F* is a sheet of glass which confines the air-current against the surface of the safe-light. As seen from the drawing, the light passing through the safe-light is that reflected from the upper surface of *G*. The upper front portion of the lamp is provided with an opaque door serving for lighting and adjusting the burner. The type of construction is adaptable to incandescent gas and electric light as well as to oil lamps. The commercial form is shown in section "Novelties in Apparatus."—Eng. Pat. No. 3,633, 1910; "B.J.," Sept. 9, 1910, p. 691.

STUDIO.

Making the Studio Roof Water-tight.—W. Cumming finds that the best results are obtained by using a mixture of white lead thinned down to the consistency of a *thick* cream with linseed oil (the thicker the mixture the better as long as it can be applied with a brush). This serves to preserve the wood, and effectually stops all leaks, and is far cheaper and less troublesome than putty. About 10 lbs. to 12 lbs. will suffice to remedy any average-sized studio roof, and allows two coats, this costing about 5s. for the material. For very bad leaks a third, or even fourth, coat between the laths and glass may be necessary, and in extreme cases white lead mixed with a little putty, and applied with a knife, is a good preparation.—"B.J.," July 1, 1910, p. 502.

McNamara and Gordon find it satisfactory to have the glass cut so as to fit loosely between the bars, then painting the rebate on which it is to rest with a liberal coating of putty. The glass is pressed firmly into place, the excess of putty squeezed out and removed both under the roof and outside it. Thus all the putty exposed to the air is a narrow strip about ⅛ in. wide between the

edges of glass and wood. This is smoothed down and painted to a width of about one inch.

Instead of painting, a very good plan is to take a strip of canvas or linen (previously coated with white lead), lay it on the glass, pressing it into the angle of the bar over the putty, but not coming outside the rebate, pressing well down so it binds well to the wood and glass, carrying the linen from the top to the bottom of the bar. The whole is then given a stout coat of white paint, which renders it absolutely water-tight. Roofs done by this method have been found to hold good for ten years without needing attention.—"B.J.," Aug. 12, 1910, p. 619.

Obscuring the Skylight.—The following is a suitable formula :—

A—Whiting		13 ozs.
Ultramarine blue	100 to	120 grs.
Gelatine		1½ ozs.
Water		24 ozs.
B—Glycerine		1½ ozs.
Starch		½ oz.
Boiled in water		10 ozs.

(Add B to A.)

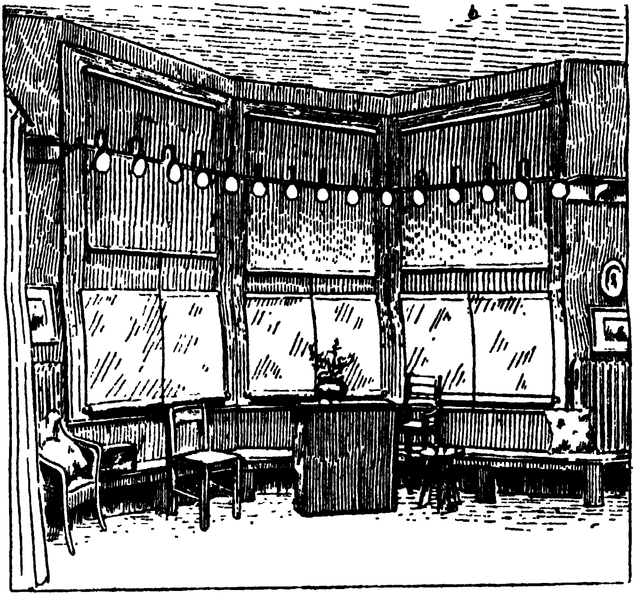
After all is dissolved, brush it on the glass with a three-inch flat paint brush. Warm the solution every time you move the ladder, and stir it. Add water a little at a time as the solution is used, as it will gradually get thicker. The best effect can be produced by using the solution quite warm and when the sun shines on the skylight. The coating can be easily removed with a sponge in the beginning of winter or in the spring before recoating.—"Bull. Phot.," June 15, 1910, p. 377.

Cleaning Windows.—A method of cleaning windows, economical of time and labour, is given by a writer in the "Storekeeper" (New York) :—Choose a dull day, or, at least, a time when the sun is not shining on the windows, for when the sun shines on the window it causes it to be dry streaked, no matter how much it is rubbed. Take a painter's brush and dust them inside and out, washing all the woodwork inside before touching the glass. The latter must be washed slowly in warm water diluted with ammonia —do not use soap. Use a small cloth with a pointed stick to get the dust out of the corners; wipe dry with a soft piece of cotton cloth—do not use linen, as it makes the glass linty when dry. Polish with tissue paper or old newspaper. You will find that this can be done in half the time taken where soap is used, and the result will be brighter windows.—"B.J.," Apr. 8, 1910, p. 259.

Fireproofing Muslin, etc.—The following are suitable mixtures :—(1) Ammonium sulphate, 8 lbs.; ammonium carbonate, 2·5 lbs.; boric acid, 3 lbs.; borax, 1·7 lbs.; starch, 2 lbs.; water, 100 lbs. Steep the fabric in the above solution, made hot, until thoroughly impregnated, then drain and dry sufficiently to enable it to be ironed or pressed like ordinary starched goods. (2) Borax, 12; Epsom salts, 9; dissolved in warm water, 80. The necessary quantity of starch can be used along with the solution. The fabric

is treated as above. (3) Boric acid, 5; sal ammoniac, 15; potash feldspar, 5; gelatine, 1½; starch paste, 50; water, 100. This mixture is applied with a brush.—"B.J." (from "Pharmaceutical Journal"), May 27, 1910, p. 410.

Incandescent Gas for Studio Lighting.—A Philadelphian photographer, W. S. Ellis, has fitted up an installation of Welsbach incandescent burners in the way shown in the illustration, all the lamps together giving a light found by measurement to be equivalent to 1,500 to 1,800 candle-power.—"Bull. Phot.," Apr. 27, 1910, p. 265; "B.J.," May 27, 1910, p. 398.



In a letter to the editor of the "B.J." Mr. Ellis states that the installation was put in as an auxiliary to the north light, and is so used regularly for sittings in the late afternoon. But it was found that by the mantles alone (without daylight) photographs could be made with exposures of three or four seconds on a rapid "Hammer" plate. No difficulty was experienced from the heat of the light, as ventilators are fixed immediately over the burners. —"B.J.," July 8, 1910, p. 523.

Acetylene, Petrol, and Magnesium Studio Lighting.—D. Berlin, in an article comparing the merits of these artificial lights for the studio, dismisses acetylene on account of the trying nature of the

light upon the sitter and of the necessity of frequently re-charging the generator.

When using magnesium the best source of light is a good flash powder. The best place for the lamp is about 8 ft. immediately in front of the sitter, 3 ft. or 4 ft. on each side of this point and about 7 ft. from the ground. This, for the average studio lighting of a head or three-quarter figure. Usually a diffusing screen should be employed, one of the best being the so-called "thin-glass" tracing paper sold in 30-in. or 40-in. widths for engineering draughtsmen. About 3 ft. of it hung in a doorway and a lamp used on the other side will allow of a number of exposures being made without smoke entering the room. The cost of flashlight for portraits, taking one or two figures with lens at $f/6$ or $f/8$ and plate about 350 H. and D., works out at from ½d. to 1d. per exposure, using a first-class powder.

For lighting by petrol-gas, or air-gas, the system consists in passing air through a saturator containing light petrol and burning this "gas" under mantles from a Bunsen burner. Various forms of pump are used for forcing the air through the vaporiser or carburetter. The best form of plant is worked by a small hot-air engine; others are worked by a water motor, whilst the third by rope and weight over a pulley, in this case a lighter and more costly spirit (gasoline) being required. Usually the best petrol must be employed, about one gallon being estimated to saturate 1,000 cubic feet of air. The burners, however, use more "gas" than a coal-gas burner, and therefore large connecting pipes, of thin zinc as a rule, are needed. Particulars of the commercial forms of air-gas plant are given in the engineering and house furnishing journals.—"B.J.," May 13, 1910, p. 356.

Lenses and Photographic Optics.

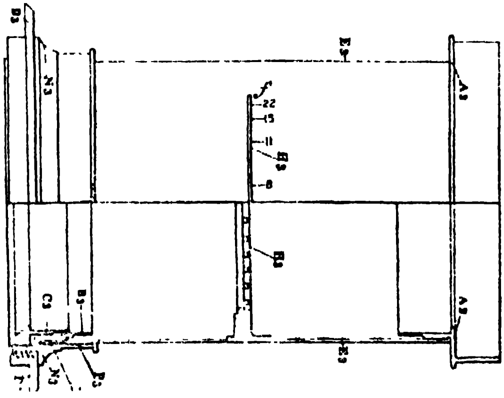
One Lens for all Purposes.—Dr. R. Luther has dealt with the question of depth of focus as affected by possible errors in the register of the plate and the surface where the image of the lens is formed. Such want of register may be caused by imperfect rigidity of the back of the camera, unevenness of the plate in the dark-slide or changing-box, or unevenness of the surface of the plate itself. It has been found that this error may easily be 1 mm. (1-25th of an inch). Dr. Luther gives tables showing the amount of depth of field which can be utilised in practice when allowance is made for the actual working conditions. He concludes that the best focal lengths for hand-camera photography are those from 5 to 10 ins., and that a first-grade anastigmat of 5 to 6 ins. focal length, used in a properly made camera, provides the best substitute for a whole series of lenses, the negatives obtained being enlarged as required.—"Phot. Rund.," Heft 1, 1910, p. 1; "B.J.," Jan. 14, 1910, p. 21.

Soft-focus Lenses for Portraiture.—E. Clifton, in the course of a series of articles, points out that "soft-focus" pictures may be made with certain classes of portrait lens—viz., those made on the

model patented by J. H. Dallmeyer. In this case the position of the crown and flint elements of the back combination is reversed when compared with the original or Petzval form, and a large or small amount of spherical aberration may be introduced by varying the separation in this combination. In the lenses made by Dallmeyer there is a convenient arrangement for doing this, with an index showing the amount of unscrewing, but with other makes it is necessary to remove the back cell and separate the lenses by partly unscrewing the counter cell. Portrait lenses of the Petzval form are not amenable to this treatment, and it is useless to attempt to obtain softness by unscrewing the back combination of any lens as a whole. The front combination of a portrait lens may be used alone as a single lens, and all the remarks applicable to landscape lenses apply equally to it.—"B.J.," May 20, 1910, p. 375.

Soft Focus with Single Lenses.—Frederick H. Evans, in commending a soft focus for securing brilliancy and roundness in both landscape and portraiture, points out that in addition to the special lenses sold for this purpose, the "Smith" (U.S.A.) and the Puyo-Pulligny (see "B.J.A.," 1907, p. 705), the old rapid landscape lens of Dallmeyer, if opened out to an aperture of $f/7$ or $f/8$, is almost as portable, in the smaller sizes, and gives equally pleasing definition. These lenses are specially useful for sunlight subjects, the roundness and softness of the images (in contrast to the "edginess" given by an anastigmat) affording a most pictorial effect.—"A.P.," Sept. 13, 1910, p. 260.

Portrait Lens Adjustment for Soft Focus.—C. F. Lan-Davis, of J. H. Dallmeyer, Limited, has patented a form of mount for the



Dallmeyer portrait lens, whereby the separation of the two elements of the back lens can be done quickly and to a determined degree without the need of locking the lens mount in its flange. This

is secured by a series of right and left handed threads, as shown in the figure. The front cell and hood A_3 screws by a right-handed thread into tube E_3. Near the other end of E_3 an external left-handed thread P_3 is cut. Below P_3 a short piece of the tube E_3 is left without thread. At the end of E_3 an internal right-handed thread R_3 is cut.

Middle cell B_3 screws into E_3 by R_3. The body ring N_3 screws on the left-handed thread P_3 and carries the flange D_3, which is attached by a right-handed thread. Back cell C_3 is attached to N_3 by a right-handed thread.—"Eng. Pat.," No. 1,141, 1909; "B.J.," Oct. 22, 1909, p. 825.

Measuring "Rapidity" of Lenses Apart from Aperture.—In reference to the variation in the "speed" of a lens due to a greater or less number of reflecting surfaces, the following method of making a measurement at the same time that the aperture of the lens is determined is suggested by a writer in the "British Journal." Suppose we are measuring the aperture by the well-known method that involves placing a brightly illuminated pinhole at the principal focus of the lens. If we place a dry-plate against the lens-hood and expose for a short time, development gives a circular dark patch, the density of which, measured in a photometer, must record the relative power of the light reaching the plate. If we now assume the lens to neither absorb nor reflect any light, it seems evident that the intensity of the light reaching the plate should be exactly the same as that of the light which reaches the entrance pupil of the lens; therefore, if we remove the lens, place a plate in the position of the entrance pupil, and expose for the same time to the same illuminated pinhole, we should get a patch of equal density, while any difference in density should afford a measure of the loss of light due to reflection and absorption. —"B.J.," Dec. 3, 1909, p. 930.

Pinhole Method of Finding Focal Length.—E. Clifton gives the following useful method of finding the focal length by comparison of the image formed by a lens with that produced by a pinhole at a known distance from the plate. This method requires several well-defined and permanent objects at a considerable distance from the camera. A pinhole having been fixed in the lens panel, the camera is adjusted so that the pinhole is exactly, say, 10 ins. from the plate. An exposure is made on the pair of distant objects and the negative preserved as a record of image produced with a 10 ins. lens. All, then, that has to be done to find the focal length of the lens is to focus on these two same objects, measure the distance between them, when a simple rule of three sum gives the equivalent focal length with a fair degree of accuracy. For example, supposing the 10 ins. pinhole gives an image of the two objects recording them 4·2 ins. apart and the image given by the lens to be tested has the objects 5·7 ins. apart; we therefore multiply 5·7 by 10 and divide by 4·2, which gives a result of 13·57 ins., the focal length to be found.—"B. J.," June 10, 1910, p. 432.

Cementing with Balsam.—When using Canada balsam for cementing lens and prism parts it is absolutely necessary to set the balsam with the aid of heat, and the trouble is that the surfaces are apt to slip when the heat is applied if the pressure is not exactly uniform, while beautiful fern patterns appear as the result of the slipping. Further than this, there is danger of over-heating the balsam and turning it yellow, while in some cases the glasses may crack. The method is to apply plain balsam softened by heat to the warmed and well-cleaned glass surfaces. We then clamp the whole together and place it in a cold-air oven, the temperature of which is then slowly raised to 200 deg. F., at which temperature it is kept for an hour. The gas is then turned out and the oven allowed to slowly cool down. When cold prisms will be found to be quite rigidly cemented together. Lenses can be more readily clamped together by simply binding with string. Prisms require to be enclosed in a frame made to shape and arranged to bring pressure to bear in several directions, so as to avoid all tendency to slip. Failure is generally due in the case of prisms to uneven pressure, and it is advisable to equalise it on the different surfaces with soft pads of thick paper. When finished, all superfluous balsam that has exuded from the edges is cleaned off with a pad of cotton wool dipped in rectified (not methylated) spirit, awkward corners being cleaned out with a brush used instead of the wool.—"B.J.," Oct. 15, 1909, p. 795.

Removing Large Lens-Cells.—Large cells, such as those of a condenser or portrait lens, can be readily removed by use of the old device known as the "Spanish windlass." Cut a piece of stout string long enough to go three times round the lens mount, with an inch or so to spare. Knot the ends strongly together, and pass the double cord thus formed once round the mount, slipping one double end through the loop formed by the other double end, and pulling it out tight. If we assume the condenser or objective to be standing before us upright on the table, and the two looped ends of the double cord to be pointed in our direction, then the end on our right-hand side should be passed through the end on the left, and the whole tightened up by pulling the loose end to the right. Through the loop of this loose end we pass the stick, pushing it through far enough to allow it to bear tangentially against the right-hand side of the lens-cell. The near end of the rod is then turned towards the right, and the screw immediately moves, provided, of course, that the mount into which it is screwed is held firmly. In the case of removing a lens-cell, naturally the cord and the stick must bear on the cell alone while the mount is being held. If any difficulty is found in holding the mount, the remedy is a second windlass fitted on the mount, but arranged in the opposite direction. On turning the two levers in opposite directions, the most stubborn screw is bound to move if it is free to move at all. The power of the arrangement, of course, depends on the length of the lever, so if the first attempt fails, the remedy is to use a longer stick.—"B.J.," July 8, 1910, p. 506.

Sizes of Stops.—A useful and easy method of finding the diameters of a series of stops in order to obtain diaphragms, each of which requires half the exposure of the preceding, is as follows: Draw a right-angled triangle, making each of the sides including the right angle equal to the diameter of the stop. The length of the long side of the triangle, that facing the right angle, is the diameter of the stop requiring half the exposure. Having fixed two of the diameters, the rest are simple multiples of these two; thus if we know the diameter of *f*/11 and find that of *f*/8 by the simple construction described, *f*/22 and *f*/44 are respectively half and a quarter of *f*/11, while *f*/16 and *f*/32 are half and a quarter of *f*/8.—"Phot.," March 1, 1910, p. 174; "B.J.," March 11, 1910, p. 169.

TELEPHOTO LENSES.

Tilting the Telephoto Camera.—E. A. and G. R. Reeve point out that when tilting the camera carrying the telephoto lens, but without swinging the back vertical (on the contrary, letting it remain at right angles to the base-board), vertical lines in the subject do not show convergent distortion, but they do show it if the back be swung vertical in the ordinary way.—"T.Q.," Dec., 1909, p. 5.

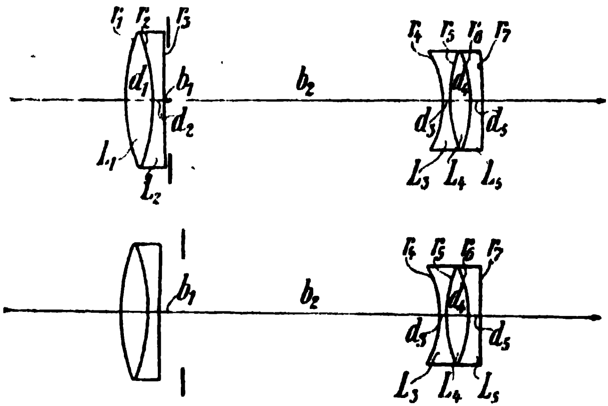
A. Thomas works out an example in confirmation of the above result, showing the extent to which the back should be swung to give the best results.—"T.Q.," March 25, 1910, p. 19.

In an article on the same point in which the result is obtained by geometrical construction, it is shown that further theoretical confirmation is given of the practice of keeping the plate at right angles to the base-board when tilting the telephoto lens.—"B.J.," May 13, 1910, p. 355.

Exposure in Telephoto Work.—Captain Owen Wheeler, in a paper before the International Congress of Photography, declares that the balance of opinion as regards exposure in telephoto work appears to be in favour of the old rule of multiplying by the square of the magnifications the exposure that would be required if the actual subject telephotographed were being photographed with the positive lens only, stopped to the same aperture. In the application of this rule it is essential to make the calculation with reference, not to the comparatively wide-angle view given by the ordinary photographic lens, but to the very narrow angle one given by the telephoto lens. Photometrically speaking, the two may be of a totally different character, one being, perhaps, an open landscape, the other a dark building. In such cases the telephotographer must consider what exposure the dark building would require if photographed with the ordinary lens, and multiply that by the square of the magnifications. As in ordinary photography, careful allowance must be made for the distance of the object, the tendency in the case of far-off mountains usually being in the direction of over-exposure. Where the magnification is very low the rule of multiplication by the square of the magnifications may be dispensed with, the aperture of the positive being multiplied by the number

of magnifications and the result taken as the working aperture of the telephoto system.—"B. J.," Aug. 12, 1910, p. 608.

Zeiss Telephoto Lens.—A recent patent granted to Messrs. Zeiss describes an improvement on the telephoto lens specified in "B.J.A.," 1907, p. 711. In the new type of construction the



number of components of the tele objective is increased from four to five, but a considerable chromatic correction of the oblique pencils is added to the previous corrections of the single aberrations. Correction of astigmatism is almost equally attained for the colours, which are visually and actinically most effective, and the differences of distortion for different colours are considerably restrained. The result is a still better definition of the image towards the margin.

The increase by one component occurs in the negative element, and this in such a manner that it is henceforth composed of a front dispersive lens, a middle collective lens, and a back dispersive lens.—Eng. Pat., No. 19,580, 1909; "B.J.," Jan. 14, 1910, p. 30.

Cameras and Accessories.

Tropical Cameras.—Capt H. G. Le Mesurier, writing at some length on the apparatus most suited for work in the tropics, says that well-seasoned mahogany will stand a uniformly dry or damp climate better than teak, though the latter is superior where hot damp and cold dry seasons alternate. If the wooden parts of the camera are of well-seasoned material and properly jointed brass binding is unnecessary, though never harmful. The bellows should be joined to the camera with brass plates, and all the screws

should be brass. It is well, also, to carry a duplicate bellows. A turn-table is very liable to give trouble in damp weather, and is a form of baseboard to be avoided.—"Phot.," June 21, 1910, p. 534.

Focussing Adjustment for Hand Cameras.—S. M. Player has patented a method of focussing without the ground glass. A glass screen is employed, of which the portion A is transparent, the portion B being silvered to form a mirror. At a suitable distance from this a second mirror C is arranged, which is adjustable on its pivot. At D is a sight. Assuming the object to be at E, the operator looks through the sight D, and through the transparent part of A until he "finds" the object. He then adjusts the pivoted mirror C until a vision of the object is transmitted on to the mirror B as shown by the lines.

It is obvious that if the object O is moved nearer to or further from the camera the mirror C must be turned through a certain angle to bring the image again on to the mirror B. The pivoted mirror C is connected with the lens, so that as it is moved to obtain the effect referred to the lens is moved for focussing purposes. All, therefore, that the operator does is to obtain a reflected image on the screen B alongside the actual object as seen through the glass A. He then knows that the focussing has been correctly effected.—"Phot.," Feb. 1, 1910, p. 87.

REFLEX CAMERAS.

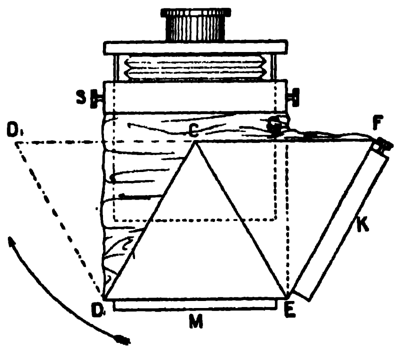
Dodging Mirror of the Reflex Camera.—The report of the action for infringement of patent brought by G. R. Nicholls against A. Kershaw is reported in "B. J.," Jan. 21, p. 52, and Jan. 28, p. 72, 1910.

Mirror and Shutter of Reflex.—A. L. Adams has patented mechanism whereby the mirror of the reflex camera is automatically put down when the shutter is re-wound after an exposure; also other movements allowing of ready time and bulb exposures.—Eng. Pat. No. 25,849, 1908; "B.J.," Jan. 28, 1910, p. 70.

Reflex Revolving Hood.—A writer in "Photography" suggests the advantage of a revolving hood for the reflex camera, particularly for figure study work. The reflex could be more easily used pointing across the body, and as the photographer would not be facing the subject his work would be less perceptible.—"Phot.," Nov. 2, 1909, p. 358.

Reflex Camera Focussing Screen.—A. L. Adams has patented mechanism whereby a pair of masking blades are automatically actuated to mask the focussing screen so as to give an upright or horizontal picture on the reversing back of the camera being placed in the corresponding position. The movement allows of this automatic indication of the exact picture being provided in a smaller space than by means of a rotating fixed mask over or under the ground glass.—Eng. Pat. No. 27,667, 1909; "B.J.," Dec. 31, 1909, p. 1014.

In Place of the Reflex for Nature Photography.—Max Steckel has designed a form of camera for natural history photography, which can be used on a level with the eye, and while permitting full-size focussing without the aid of a mirror allows of the plate being rapidly brought into the position of the ground glass. This is done by mounting the hinder part of the apparatus CDEF on



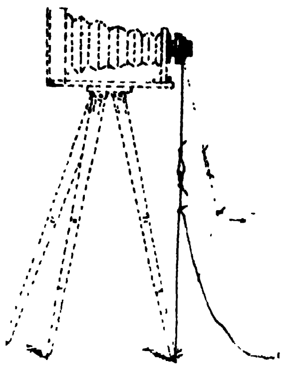
an axis at C. M is the ground glass, K the focal-plane shutter. The subject is focussed by the rack-and-pinion S, and when the exposure is to be made the hinder part is moved round so that D takes the position D′. Though much heavier and more bulky than a repeating-back, the device has the advantage of rapid operation and is less liable to disturb the line of view than the direct to-and-fro movement of a repeating-back.—"D. Phot. Zeit.," May 6, 1910, p. 191; "B.J.," May 13, 1910, p. 365.

Reflex "Telephoto" Camera.—A description of the latest model of the Vautier-Dufour camera, in which a large aperture lens of long focus is used in a camera of comparatively small dimensions, is given in the "Scientific American," March, 1910, p. 260. The path of the rays between the lens and the plate is split up by two mirrors, a camera of 16 ins. in length thus permitting the use of a lens of 48 ins. equivalent focal length

A description of the Vautier-Dufour camera, as made by Messrs. Gautier Frères, Grandson, Neuchatel, is given, together with the reproductions of some results, in "A.P.," May 24, 1910, p. 517.

INSTANTANEOUS SHUTTERS.

A Simple Shutter Release.—P. Barrows recommends the following simple method of releasing the trigger of a shutter when at a distance from the camera. A short piece of string is fastened to the lower end of the front leg of the tripod and a loop that will not slip made at the other end of the string. Another piece of



string is attached to the release lever of the shutter with the latter in its highest position and the loose end of this string is then passed through the loop in the lower string and gently pulled until the shutter snaps. The two pieces of string will then be just tight enough and are fastened together by a knot. A fine thread is then fastened to the string about half-way up and the slightest pull on the thread, as shown in the dotted lines, will release the shutter.—"Cam. Craft," March, 1910, p. 107.

Measuring Shutter Speeds.—The following method has been worked out by A. Campbell and T. Smith, of the National Physical Laboratory :—A vibrating beam of light falling through a narrow slit on to a moving plate serves to measure the time. This beam is obtained by reflecting the light of a Nernst lamp from the mirror (area 50 sq. mm.) of a vibration galvanometer actuated by a current of fixed frequency (say 100 to 500 vibrations per second) obtained from a microphone hummer. The use of the vibration galvanometer, in which the amplitude is enormously increased by resonance, greatly facilitates the measurements.

When the total duration of exposure only is required, the vibrating

beam of light is passed through the shutter, tracing a sine-curve on the moving plate. The duration of exposure is immediately found by counting the number of ripples recorded on the plate. Ten records of the various speeds of a shutter can be taken side by side on one 5in. x 4in. plate in one minute. The accuracy of the method was found to be within .0001 second (one ten thousandth of a second) at the highest speeds.

When the efficiency, in addition to the duration of exposure, is required, the method adopted is essentially that of Sir Wm. Abney, but the time measurements are made with the vibrating beam of light instead of a screen. The sine-curve now extends over the length of the plate. and serves as a continuous time record, and is to be preferred to any intermittent method of measuring the time. A slit is placed in a diameter of the shutter-opening as close to the shutter leaves as possible, and an image of a line source of light is made to fill this slit. By means of a concave mirror an image of this slit is formed on the plate by the side of the vibrating beam of light. As the shutter opens, the length of the slit through which light can reach the plate increases, and the record on the plate gives the length of the slit, which is opened at every instant of time. Measurements are then taken of the area of the shutter aperture corresponding to a number of lengths of the slit-opening. Combining these records the area of the shutter aperture at every instant of the exposure is obtained, and by integrating this area with respect to time the equivalent exposure at full aperture and the efficiency are calculated.—"B.J.," Nov. 19, 1909, p. 894.

Artificial Light.

Studio Light.- See under "Studio" and "Portraiture."

Carbons for Arc Lamps.—The Westminster Engineering Co give the following data as to the use of cored or solid carbons in arc lamps used on given circuits:—

100 to 120 volts continuous current or alternating current = 2 cored carbons.

200 to 250 volts continuous current = 2 solid carbons.

200 to 250 volts alternating current = 1 solid, 1 cored carbon.

400 to 500 volts continuous current = 2 solid carbons.

—"B.J.," October 7, 1910, p. 771.

FLASHLIGHT.

Flashlight Powders.—Dr. A. Lesmüller has improved the mixtures described in patent No. 27,341, 1908, for preparing flash powders with silicon, boron, etc., as a base. The improvements consist in adding sulphides of iron, manganese, or copper, the addition of which produces light rich in ultra-violet, and at the same time reduces smoke. Uranium instead of silicon, etc., also improves the powder. The best oxidising constituents of the powder are peroxides of the heavy metals and chromates and permanganates.—Eng. Pat. No. 13,331, 1909; "B.J.," July 8, 1910, p. 518.

The Effect of the Lamp on the Flame Given by a Flash Powder.—D. Berlin, as the result of a number of tests made to ascertain the effect which is produced upon the shape and size of a flash-powder flame by the shape of the trough in which it is burnt, finds that the shape of the tray has more effect on the flame than any device over the top, the gutter-shaped trough apparently making the flame spread fan-shape, whereas on a flat surface one would expect a pear-shaped flame. This is, of course, a point in favour of the trough.—"B.J.," Dec. 17, 1909, p. 967. (See also "Flash-light Work" in Section III.)

MATERIALS.

Melting Point of Gelatine Jellies.—Charles W. Gamble has described the precautions requiring to be taken (to ensure accuracy) when making determinations of the melting point of a gelatine jelly by the capillary tube method.—"B.J.," Sept. 2, 1910, p. 668.

III. — PHOTOGRAPHING VARIOUS SUBJECTS.

Portraiture.

Portraits with White Backgrounds.—H. E. Corke, in an article on the studio production of the popular "sketch" or white background portrait, gives as the first essential a background distinctly bluish-white, not cream. Even pale blue is better than pure white. The ground should be placed so that it can be lighted quite independently of the sitter. It should be given as strong an illumination as possible, and for this purpose may be tilted towards the skylight instead of being placed vertical.

For such portraits it is best to avoid strong contrast and to light the sitter with a full flat lighting, so as to produce a delicate effect.

In order to get a quite white ground in the print it is necessary to block-out on the negative. The negative is placed in the printing frame in the usual manner, and then the front of the frame covered with a piece of cardboard, in which is cut a hole rather larger than the part of the negative occupied by the figure just as an ordinary vignetting shape is attached. This hole is then covered with a piece of tracing-paper. The frame is then held up to the light, and the background painted over on the tracing-paper so as to make it quite opaque (see figure).

Any sort of paint will serve for this purpose, such as yellow, red, or black water-colour, but perhaps the cheapest method is to procure a pound of either yellow or red ochre at the oil merchant's in the form of a dry powder, and use this with water and just a little gum to prevent it flaking off. Care should be taken to gum the negative into the frame with small strips of paper, or when attending to the painting it will be forgotten that the frame is tilting backwards, and the negative will fall out.

The chief advantage of this method is that the negative itself is not painted upon, and therefore the hard cut out appearance so often seen is avoided. The printing frames used for this purpose

should be as shallow as possible, thus avoiding the light spreading and ensuring more accurate results. Printing of negatives so

treated should be done in a good even light; the best plan is to put the printing frame at the bottom of a deep box, as in printing from a cracked negative.—"B.J.," Nov. 5, 1909, p. 855.

Portrait Lighting in the Studio.—H. Essenhigh Corke, in a series of articles on this subject, has given many useful hints on the arrangement of the studio and studio blinds for different methods of lighting, and has described several useful accessories of special design.

The most efficient blinds for the studio skylight are those running in a series of festoons along a pair of stout, tightly stretched wires, so that any blind can overlap the next, excluding direct light. Best, also, to have the blinds in a double set, the upper of dark and the lower of white muslin (fig. 1).

The most useful schemes of lighting for average work are the "plain 45 deg. light," "plain side lighting," and "Rembrandt," further varieties of these being obtainable.

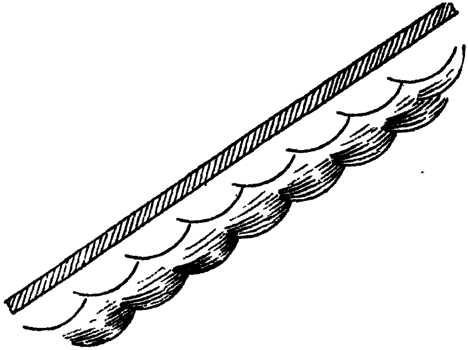


Fig. 1.

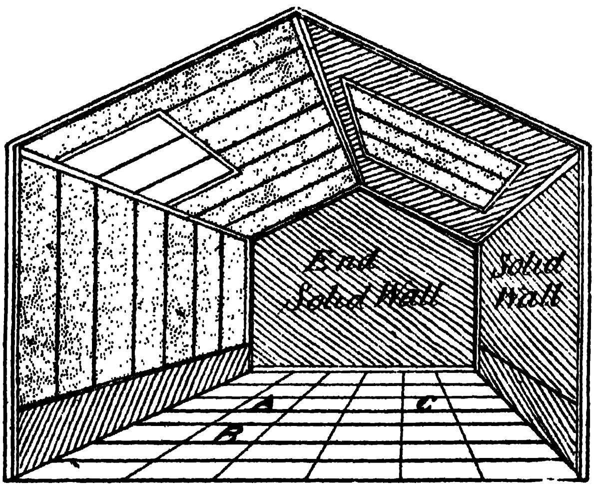


Fig. 2.

Typical diagrammatic view of 45° lighting scheme.

The letters represent position of sitter in relation to lighting area indicated. Camera presumed to be looking straight towards end wall, which may conveniently carry the background, or the background may be on a movable stand placed behind the sitter. If sitter be placed further back at A more light will fall on the shadow cheek, or if placed at B the ear and cheek-bone of the light side of face will be made more prominent. As the position of the sitter is altered in the direction of C the softer and "less cutting" will the light become.

45 Deg. Lighting.

For this a fairly broad flood of light should come in a direction of 45 deg. to the floor of the studio or (the same thing) to the vertical. Two methods may be adopted to do this, (1) opening a fairly large area in the skylight blind, or, (2) using a smaller area but placing the sitter further away. The former is usually preferable, since it allows of shorter exposures; but much depends on the blinds at disposal. If these are all dark the sitter must be placed

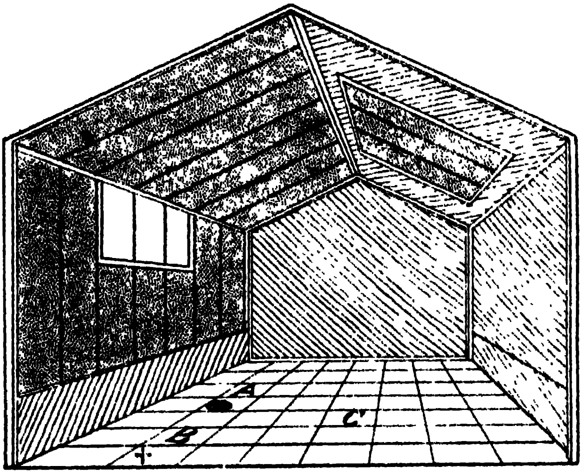


Fig. 3.

Typical diagrammatic view of side lighting scheme.

The dot represents position of sitter in relation to the lighting area indicated. Camera presumed to be at + and looking straight towards end wall (parallel with side of studio). If sitter be moved to A light will also catch the cheek of shadow side of face, or if as far forward as B will only catch the back of ear, cheek, and very fully on the nose. If sitter be moved towards C much softer effect of side light is produced, greatly obviating the necessity of a reflector.

further off in order to get diffusion of the light, whilst when white blinds only are available the sitter is to be placed nearer to the open area of light in order to secure more contrast in the lighting. This represents the extremes, both of which are best avoided. For average cabinet-head portraits an area in the blinds of about 6 or 8 sq. ft. is used. Fig. 2 shows a fairly typical arrangement, suitable for a full face or slightly three-quarter face portrait. In using this form of light notice that, as the light strikes upon the forehead, cheek-bone, and side of the nose and chin nearest the light, it seems to creep round gradually on to the farther cheek-bone, throwing on to it a triangular patch of light, varying in

shape with the features (acute or plump) of the sitter. The larger the open area of light the softer this patch on the shadow side becomes; it becomes softer, too, as the sitter turns the head more directly facing the source of light. The appearance of this light, and also of the shadow cast by the nose, should guide one in the lighting. Usually the shadow of the nose should fall downwards as well as sideways—say, so that the tip of the shadow about reaches

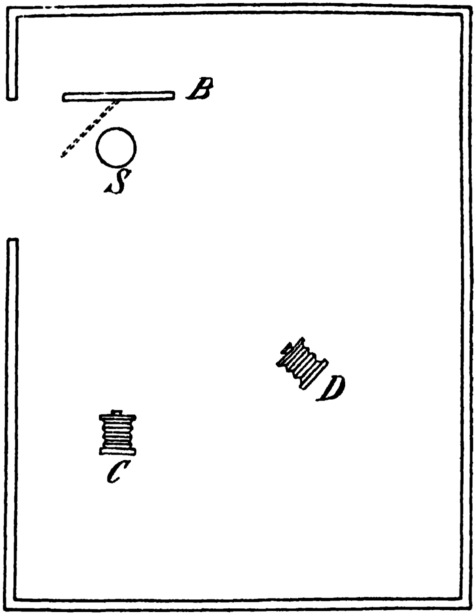


Fig. 4.

Diagram of side light and change to line light. S, sitter; B, background (dotted line shows position of background for line light); C, camera for side light; D, camera for line light.

the corner of the mouth. Placing the sitter a little more directly under the open area, or adjusting the blinds themselves, will enable this effect to be secured.

The more directly the light comes from above the greater the accentuation of cheek-bones, sunken eyes, etc.; the more forward and lower the lighting area the flatter and less pronounced is the lighting secured.

Plain Side Lighting.

This form of lighting throws up the modelling more strongly than a 45-deg. scheme, and is therefore useful for flattering the

subject. The essential feature of the lighting is to bring the lighting area more nearly on a level with the sitter and well from one side. Fig. 3 shows a typical arrangement. An area of side light about 6 ft. from the floor and about 4 ft. square is arranged, the sitter placed about 10 ft. towards the centre of the studio and facing the camera, +. In this position one-half of the face is strongly lighted; the other is heavy shade—not at all a pleasing arrangement. On now moving the sitter 3 or 4 ft. further from

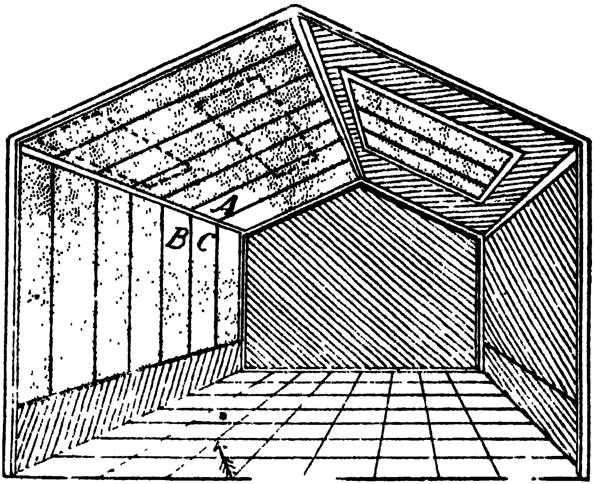


Fig. 5.

Typical diagrammatic view of "Rembrandt" or line lighting scheme.
The square to which the arrow points represents position of camera in relation to lighting area. Camera to be placed in direction shown by arrow. The background must be so placed behind the sitter so that it does not cut off the light. Great variation can be made by partly or fully covering up *A*, *B* or *C* as required, as also will the exact direction of the sitter's head towards or away from the light. If white blinds only obscure the light in the regions indicated by the dotted lines the heaviness of the shadows can be much reduced.

the camera and away from the side light the sitter is obtained with a good deal of the light behind and in a position where the slightest turn of the head makes a marked difference in the effect, this latter being obtained by carefully watching the sitter when making the final adjustment.

Rembrandt or Line Lighting.

The principle of this lighting is the use of a lighting area somewhat behind and to one side of the sitter, but outside the field of the lens. The scheme is best used with a dark background, which helps to concentrate the brilliant light on the profile by providing

extreme contrast to it; also the shadow side of the face would stand out too prominently from a light background. Figs. 4 and 5 show the arrangement of the studio for Rembrandt lighting. Fig. 4 shows the alteration to be made in the position of the camera and the background in order to obtain the line lighting when sitter, etc., has been arranged for side lighting. For such lighting schemes as these it is very essential that the lens should be screened from direct light. Exposure, too, must be ample, and

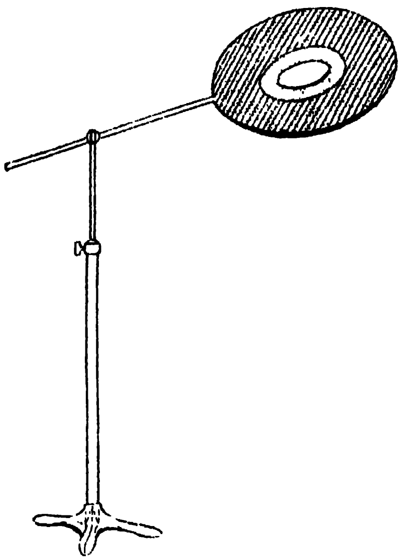


Fig. 6.

Diagram of head screen showing central aperture, muslin and rose pink calico.

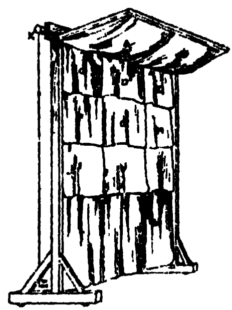


Fig. 7.

as a rule the shadow side of the face will do with a little diffused light from a reflector.

For ready control of light and shade, with soft half-tones and nicely accentuated high-lights, Mr. Corke prefers a screen shown in Fig. 6, consisting of a wire ring covered with plain calico, dyed rose pink. A clear centre disc is cut out about 1 ft. diameter, and this is covered with thin butter muslin. This in turn is cut out in the centre about 6 ins. diameter, so that the whole screen is like a target, with the small clear opening for the bull's-eye.

For more special schemes of lighting a screen which allows of every adjustment is that shown in Fig. 7. It is a frame 7 ft. high by 6 ft. wide, fitted with wires which carry small blinds or curtains,

each about 12 ins. square and of rose colour. These curtains, when fully extended, block out the light falling on the outside of the screen. At the top of the frame two blinds are fixed at an angle of about 45 degs., and behind the screen is a rod which can be raised or lowered, and over which a long plain piece of muslin can be thrown for diffusing, or a piece of opaque material when it is required to cut off all light from the lower part of the subject. In use, this screen is placed quite close to the sitter, the little curtains moved by a short rod, and the effect of each adjustment carefully observed from behind the camera. This dispenses with adjustment of the skylight blinds, of which those behind the screen are opened to the full, the others closed, so that the sitter is lighted by rays coming through the screen. When the desired effect is obtained the skylight blinds may be opened to give diffused light in the shadows (this instead of a reflector), or a reflector used while blinds remain closed.—"B.J.," Mar. 18 and 25, pp. 191 and 224; Apr. 1, 8, and 15, pp. 243, 260, and 287, 1910.

Photographing of Children.—In a paper read before the Professional Photographers' Congress, Richard N. Speaight gave a number of hints from his experience in photographing children. It was essential to meet the child at its own level, not simply in the way of talking to it, but actually to go down on the floor and make friends with it. The simpler the camera and shutter the better, for in photographing children they met with rough handling. He laid great importance upon giving a fairly long exposure, one of 1½ to 2 secs.: a snapshot of a thirtieth of a second or less appeared to him to give a caricature of a child's expression, and almost without exception his portraits of children were taken with exposures longer than 1 sec.—"B.J.," Apr. 15, 1910, p. 284.

Reflex Camera in Studio Portraiture of Children.—Gordon Chase, in a paper before the Professional Photographers' Congress, drew attention to the advantages of the reflex camera in the studio used on the lines described by him some year or two ago ("B.J.A.," 1908, p. 595). He showed the stand for supporting the reflex at a series of convenient heights, as already illustrated in "B.J.A.," 1909, p. 541. The reflector form of camera is found of service in several ways. It allows of the focussing cloth being dispensed with; it enables the photographer to see the subject up to the instant of exposure, and, if necessary, to place the plate in a horizontal position instead of upright immediately before making the exposure. This is useful when the subject suddenly re arranges itself in a different way. It is found that out of twelve exposures on a child ten were obtained which were quite good for proofing to the sitter, a higher percentage than is usual with the bulb shutter. One caution is necessary—the photographer's eyes are usually at a higher level than the lens of the reflex, and allowance needs to be made for that, otherwise portraits at times would show too much of the sitter's nostrils in consequence of the lower point of view of the lens.

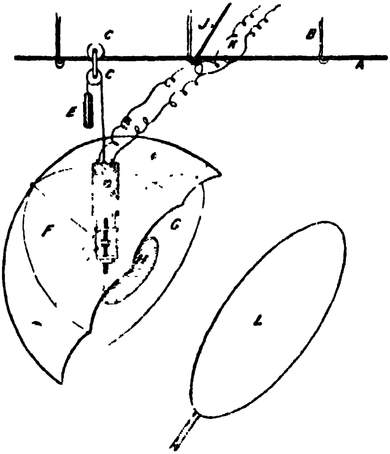
A commercial advantage of the reflex is that the customer can

be shown a picture in colours the right way up on the focussing-screen, and as a result can often be induced to purchase a miniature or enlargement in colours.

The reflex is also very useful in At Home portraiture, since it is not necessary to get behind the camera for focussing, and in some rooms the two feet or so thus gained means that a much better position can be taken for the portrait.—"B.J.," Apr. 22, 1910, p. 303.

Red-Sensitive Plates in Portraiture.—A very strong case for the red-sensitive plate in portrait photography is put by R. J. Wallace, who very clearly points out that the sitter is a coloured object, and that, therefore, the most satisfactory method of obtaining a good negative is by means of a colour-sensitive plate and adjusted filter. Mr. Wallace states the difficulties in the way, but describes colour-correct photography as the "coming factor in portrait work."—"Phot. Progress," Oct., 1909, p. 154; "B.J.," Oct. 22, 1909, p. 818.

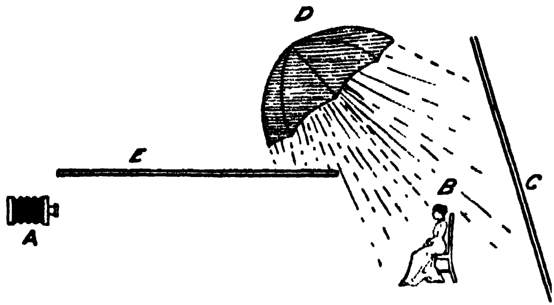
Studio Portraiture with One Arc Lamp.—L. C. Coward describes practical methods of fixing and using an enclosed arc lamp for studio portraiture. A cheap method of support is to use a stout iron bar about 3 x 1 in., section A, held from below by hooks B,



A. Iron Bar. *B.* Supports for Bar. *C.* Pulleys. *D.* Lamp. *E.* Supporting Weight. *F.* Umbrella Reflector. *G.* Gauge Screen. *H.* Asbestos. *J.* Indiarubber Cord. *K.* Insulated Wires. *L.* Additional Screen.

so that the lamp can be run along the bar on a pulley C, from which it is suspended, and can be raised or lowered in conjunction with the counterpoise E. Bar is fixed across the studio with hooks at intervals about 3 yards.

For diffusing and reflecting the light an umbrella-shaped frame is purchased or made, whilst in front of the lamp is fixed a hoop covered with thin cream muslin, a circular central disc H of thin white asbestos being stitched to the muslin. This diffusing screen is placed, as shown, about 6 ins. from the light. A good average distance of the lamp from sitter is 10 to 12 ft., and even with additional diffusing screen L exposures at f/6 on a rapid plate will run to not more than two or three seconds.



A. Position of Camera. *B*. Sitter *C*. Background as used in foggy weather with screen. *E*. For cutting off rays of light from arc. *D*. Between filter and lens.

An important point in portraiture with the arc is to screen the lens thoroughly with a hood 12 or 18 ins. in length.

Fog in the studio is perhaps the greatest trouble in artificial light portraiture; a well-warmed studio will diminish it, but the most efficient remedy is to ensure that none of the space between sitter and lens is lighted by the lamp. For this purpose some large opaque screen should be used, as shown in fig. 2, which is a view looking down from the roof of studio, though for clearness the sitter is shown side view.—"B. J.," Jan. 21, 1910, p. 41.

Electric Light Portraiture.—At the Professional Photographers' Congress, held in April, 1910, demonstrations of the leading methods of electric light portraiture were given—namely, that with open arc lamps used with reflected light, by T. C. Turner and Alfred Ellis, who used respectively the "Jupiter" lamp of Messrs. Griffin and the Boardman lamp of Messrs. Marion; also that with enclosed arc lighting shown by W. E. Gray with the lamps of the Westminster Engineering Company. A report of the demonstrations appears in "B.J.," April 15, p. 283, and April 22, pp. 299 and 302, 1910.

Photography on Tour.

Permits to Photograph.—The "Architect," in an issue of November, 1909, gave official particulars of the conditions under which permission to photograph is granted in the English cathedrals. In

most cases application in writing to the dean is all that is necessary. At Chichester a charge of half-a-crown is made, which is also the fee at St. Paul's, Truro, and York. At Southwark the fee is 5s., whilst in the case of Westminster Abbey, where permission is granted only in exceptional cases, a fee of 5s. is paid to the Fabric Fund for each view or object photographed within the church.—"B. J.," Nov. 12, 1909, p. 876.

Miscellaneous Subjects.

Hand-Camera Photography.—James A. Sinclair, in a lengthy paper before the R.P.S., has dealt with the factors concerning both exposure and development, contributing to successful hand-camera photography. One of the first conditions is to ensure the perfect light-tightness of the camera, which means being alive to the possible causes of leakage of light. In the first place, light may quite conceivably find entrance at the lens flange. The flange may be screwed carefully on the camera and may be recessed, but the best wood in the world will warp and get out of place, and then the camera front which was safe last year causes trouble when taken out for a new season's work. Then the velveting of the rising front may wear, and light again find its way into the instrument. A fruitful source of trouble will also be found with old slides that are out of plane and do not fit tightly against the back of the camera. and the fronts of changing boxes are equally liable to this defect. Celluloid shutters at the front of dark slides, if more durable than common vulcanite, are cheaper than good vulcanite, and particularly liable to give trouble. They get out of shape and keep valves open, they shrink, and do not fill the orifice in the slides. Test your camera carefully each spring by putting an electric light inside it in a dark-room and see if any light can be seen, after waiting for a few minutes.

Apart from light affecting the plates through imperfect dark slides, trouble is sometimes caused by emanations from the wood itself, and this may be greatly minimised, if not entirely prevented, by using a celluloid black for the inside of the slides. Without this protection, probably, quite apart from any natural and prejudicial attributes in the wood, the oil used for French polishing may itself be the cause of the trouble, not that it directly reaches the plates, but the emanations from it gradually pass through the pores of the wood and thus affect the sensitive plate. The celluloid varnish fills the pores of the wood and tends to obviate the trouble.

One other warning on the matter of light must be given. Some makes of folding cameras are fitted with shutters, the blades of which are of thin vulcanite. These are sufficient for all practical purposes, but care should be taken not to carry the camera with the sun shining on the shutter while it is in close proximity to the plate or film. Many spoilt films are due to this cause. No trouble is caused if the camera front is kept extended.

For the purpose of being able to judge distances more easily, it is well to estimate them in yards, not feet, and to have the focussing

scale marked in yards. The most useful distances are 4, 6, and 8 yards.—"B.J.," April 8, 1910, p. 262.

Exposures for Moving Objects.—The basis of calculations for the speed of shutter necessary when photographing moving objects is the amount of movement of the *image* of the moving object on the plate. This movement should not be more than 1-200th of an inch, or, at the most, not more than 1-100th of an inch. Assuming that a shutter-speed of 1-200th sec. is available, this means that the image must not move more than one inch in one second. Using a 5-in. lens, then a man 6 ft. in height at a distance of 25 ft. will be 1 in. high on the focussing screen, and, therefore, in order to be sharply rendered should not be moving more than 3½ miles per hour. Similarly, it can be shown that under the same conditions a train travelling at thirty-five miles per hour should be ten times as far away, or 250 ft. These calculations apply when the moving object is moving at right angles across the axis of the lens.

If the direction of the movement is changed broadside-on to a direct approach or recession of the object, then we can divide the distance, or multiply the speed, by three. If the direction of the movement is at an angle of 45 across the field of view, we can reduce the distance by a quarter or increase the speed of the object by a third, but a more useful case to consider than either of these is when the object is travelling to or from us in a direction crossing the lens axis at about an angle of 30 degrees. In these conditions we can halve the distance or double the speed. If, then, we also permit a blur of 1-100th inch, our shutter speed of 1-200th sec. will enable us to deal with the case of a man running obliquely towards us at a distance of 25 ft. and a speed of four times 3½, or fourteen miles per hour. It is thus apparent that a good deal may be done with a shutter speed of 1-200th sec. at such events as sports and races.

We may now consider the case of the focal-plane shutter, which is capable of giving shorter exposures than the average lens shutter, though it is open to doubt if the extremely high speeds usually associated with focal-plane shutters are actually reached. So far as we know, the highest speed ever recorded by a careful test in the case of a lens shutter is about 1-350th sec. For the sake of argument, we will allow 1-400th sec. as a possible focal-plane exposure, and see how this affects the cases previously considered. It is obvious that halving the time of exposure permits us to either halve the distance of the object or double its speed. That is to say, we can get within 12 ft. of the man running at fourteen miles an hour at an angle of 30 degrees, or we can deal satisfactorily with some more mobile object moving at twenty-eight miles per hour at a distance of 25 ft. If we go back to our first case—that of the man moving across the line of sight—it is evident that he can increase his speed to fourteen miles per hour at a distance of 25 ft., while a vehicle in the centre of the road going at seven miles per hour can also be satisfactorily dealt with. It must not be forgotten that we are allowing a blur of 1-100th inch. In these cases, if we want critical defini-

tion the rates must, of course, be halved.—"B.J.," Jan. 7, 1910, p. 3.

Snowscapes.—E. Owen recommends a meter as the only satisfactory way of gauging exposure for snow-covered landscapes. The meter is held about a foot from the body and turned towards the sky (but not so that direct sunshine falls on the paper), the reading so obtained being from three to four times the correct exposure. If much deep shadow occurs in the subject—that is, trees or buildings not in sunshine (but not merely expanses of snow partially shielded from light)—the exposure may be increased up to the full time indicated by the meter. But a longer exposure than this is never needed for outdoor snow scenes. These instructions are given in reference to the Watkins "Bee" meter.—"Phot.," Jan. 25, 1910, p. 76.

Shop Windows.—A. E. Smith, commenting on suggested methods for avoiding reflections of buildings on the opposite side of the way when photographing shop fronts, says that the only really satisfactory method is to choose a time when the sun is not shining on the opposite buildings.—"B.J.," Mar. 25, 1910, p. 237.

Night Photography.—J. W. Bowers, in a paper before the North Middlesex Society, gives a useful account of the approved methods of outdoor photography by night, moonlight subjects, street scenes, firework displays, etc.—"B.J.," July 29, 1910, p. 569.

Fire Scenes.—A. England, in describing the method used in issuing postcards for sale of a fire within three-quarters of an hour of the exposure being made, states that a realistic effect in the prints was secured by adding dye to the developer, which was the metol-hydroquinone of the Velox strength used undiluted. For taking the negative an ordinary plate was found better than one of the ortho' kind.—"B.J.," Feb. 18, 1910, p. 128.

Machinery in Workshops.—A writer in "Machinery" points out the labour which can be saved in preparing negatives of machines, etc., which have to be photographed in the shop by rigging up a temporary background. This saves the blocking out of other machines or details in the rear of the subject, but frequently the only background available calls for almost as much retouching of creases and dirty marks as would have been necessary without its use. If, however, the background be kept on the move during exposure all these defects are smoothed out and a negative obtained which calls for scarcely any blocking out.

The dodge has a further use. When photographing a long machine—one longer than the background available—the latter is kept moving from end to end of the machine, and thus gives a clear ground, against which the machine shows up well, all detail or other plant in the shop being subdued. It is unnecessary to block out these latter as a rule, as they rather improve the appearance of the picture and give some idea of the size of the machine.—"B.J.," Nov. 12, 1909, p. 875.

Kite Photographs.—K. T. Burkitt describes the arrangement for taking photographs with a light quarter-plate camera attached to a battery of four of the ordinary toy box kites. The camera requires to be lightly built of card and fitted with a single lens of $f/16$ aperture. The shutter is a disc of cardboard revolving on a pin on the camera front with a piece of elastic to draw it round, and with a hole cut near the periphery, which hole should be not less than three times the diameter of the stop. The lighter the shutter is and the more freely it moves the better. It may be made of ferrotype, if preferred, and should be coated all over with dead black paint.

To set the shutter, it is drawn back against the tension of the elastic with a piece of fuse, which is carried round from the front to the side of the camera, along one side diagonally to a point near the top, where it is made secure. There is a loop in the fuse, which is cut through and lit. The loop must be far enough from the front of the camera to make sure that there will be no smoke from it near the lens when it is burned through, easily managed as the wind quickly carries the smoke away, and unless there is a wind the apparatus cannot be used. The camera is made of fixed-focus, the back being provided with a frame against which the plate (or, better, cut-film) beds and is enclosed by a light-tight cardboard lid secured by an elastic band.

The suspension of the camera should be made by means of four cords from its corners, so arranged that it hangs level, the cords being at least 5 ft. long. If there is plenty of "lift," the camera may be attached to the centre of a light cross made of two strips of lath, each 10 or 15 ins. long, and the cords tied to the ends of the laths. This arrangement is steadier. The fuse is made by dipping ordinary wool into a strong solution of saltpetre in water and drying it.

When all is ready a day when there is a fairly stiff steady breeze should be selected, and the kite first flown alone. It is then hauled down until the camera can be hung from the ring on the line, and is then allowed to go up again, the last thing being to light the two ends of the fuse, the loop being cut for the purpose. Ample fuse should be allowed, and the camera left up until one may be sure that the exposure has been made.—"Phot.," Sept. 13, 1910, p. 221.

Copying.

Correction of Distortion in Copying.—H. C. Browne, as the result of mathematical investigation, has arrived at the following method of adjusting the enlarging camera and easel when correcting distortion in the negative caused by tilting the camera at the time of making the exposure :—

Assuming that the apparatus to be used for copying has a central swing to both negative and copyholder, and *a vertical rise and fall* to the lens, let us take first the most ordinary case A, in which we have a distorted negative of a building or other object, the correct proportions of which are known, but without any data as to the tilt

of the camera at the time of exposure. The process will then be as follows :—

1. With negative and copyholder both vertical, and lens axis in the middle line, adjust until the width of the middle line of the image is that required. The image will now, of course, show the same distortion as the negative. The distance between negative and lens must not again be altered.

By the middle line of the image above we mean that part of the image which is unaffected by the use of the negative swing. This should coincide with the middle line of the copyholder, so that the swing of the latter also does not disturb the focus.

2. Tilt the negative slightly in the required direction, and tilt the copyholder until the image is again in focus. If the lines still converge tilt the negative a little more and focus again. When parallelism has been secured the tilt of the negative may be fixed, and must not again be altered.

3. Examine whether the image is of the correct height or not. If not proceed as follows :-

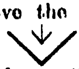
To increase height.

Move the lens slightly by means of the rising and falling front so that the movement is *outwards* from the apex of the angle formed between the negative and the copy .

Rack *in* the copyholder towards the lens until the portion of the image which falls on the middle line of the holder is in focus.

Reduce the tilt of the copyholder until the whole image is sharp. The width of the image will be found still correct, and the lines parallel, while the height will have altered in the desired direction. If the height is still too small the process may be repeated.

To diminish height.

Move the lens so that the movement is *inwards* towards the angle 

Rack *out* the copyholder.

Increase tilt of copyholder.

It will be noticed that some of the movements above are probably the opposite to those we would have tried if experimenting. It is seen that nothing is done on chance, there is no uncertainty, and the various approximations can be rapidly performed. The operations 1, 2, 3 are easier to carry out than to describe.

It may be pointed out here that a clock dial, or a single measured window, will be enough to give the correct proportions of the copy. Where there is no way of recording the tilt of the camera, sufficient data for carrying out correction can be secured with very little trouble. All that is necessary is to take a note of the dimensions of a doorway or other easily accessible feature in the building photographed. When the image of this is seen in correct proportion upon the focussing screen of the copying apparatus the whole copy will be correct.—"B.J.," Jan. 7, 1910, p. 4.

Calculable Distortion.—Dr. R. Luther has described an apparatus in which the principle of the distortion of a moving object when

photographed by a shutter of the focal-plane type is applied to producing variations in a design or pattern by drawing out the design in one or more given directions. This is done by keeping the design fixed and moving the plate at the same time as the exposing slit. The formulæ necessary for making such an apparatus and examples of the results produced are given.—"Phot. Rund," Heft 2, 1910, p. 20; "B. J.," Feb. 25, 1910, p. 137.

Flashlight Work.

Commercial Flashlight Work.—H. Andrews records his experience as a photographer called upon to do much flashlight work of dinners, theatricals, and such subjects.

Outfit.—The flash-lamp should be one burning flash-powder; the lamps in which magnesium powder is blown through a spirit flame are useless for commercial work. A very efficient lamp can be made by forming a long narrow trough, about 3 ft. x 3 ft. x 4 ins., preferably of aluminium on account of lightness. This is mounted on a light piece of matchboard, which, in turn, is fitted with a bush on the under side, so that it can be raised on a rod or tripod to the necessary height. The best means of ignition is with a bit of gun cotton fired by a taper mounted on the end of a long rod. The telescopic leg of one of the light metal tripods would be a convenient form of this latter.

Powder should be purchased, not made. Any of the rapid-flash powders would answer well—*e.g.*, the "Argentorat" and the "Ideal."

Then lens should be used with about *f*/16 to about *f*/11 stop. Larger aperture will mean that all parts of the subject will not be in focus, whilst further stopping down means a great deal of powder.

The lamp should be fixed as high as possible and immediately behind the camera; never where light can reach the lens. The subject having been arranged and focussed, the dark slide is inserted and the shutter withdrawn. Not until this has been done should the powder be taken from the stoppered bottle in which it is carried and spread out in a train in the tray. Some knack is needed in spreading it out, in order to secure a large sheet of light instead of an intense concentrated flash. In the middle of the train of powder place a piece of gun-cotton about the size of a small nut, cover this with a little powder, and apply the lighted taper by means of the holder, taking a final look to see that the trail of powder is unbroken. It is important to make the exposure as quickly as possible after laying out the powder, otherwise the powder will fire with a loud report, the noise being greater the longer the powder is exposed to the air.

The fastest plates should be used, and any lights close to the camera turned out—those in the distance will not matter. An average weight of powder for exposure on a public dinner is about 25 gms. If a full *f*/8 aperture of lens can be used for the subject enough powder to cover a shilling is sufficient. In the case of a

large hall, or when it is necessary to stop down to f/22, more powder must be used.—"B.J.," Oct. 29, 1909, p. 836.

Arc Lamp for Printing from Flashlight Negatives.—Gordon Chase points out that the defect of a flashlight negative in the way of thinness towards the corners, due to lesser illumination when making the exposure, can be compensated for by holding the negative close to an enclosed arc lamp when making the print. The densest part of the negative is thus kept close to the light, the power of which is less at the corners of the negative.—"B.J.," Jan. 14, 1910, p. 34.

Metal Ignition of Flash Powder.—W. Thomas expresses his satisfaction with a new type of ignition for flash powder (the improved "Agfa" flash lamp), in which two small friction wheels of pyrophorous metal are used to give a series of sparks which ignite the flash powder.—"B.J.," Jan. 28, 1910, p. 64.

The lamp in its commercial form is described in "B.J.," Mar. 25, 1910, p. 234. See also under "Novelties" in this volume.

See under "Flashlight" in Section II.

Stereoscopic Photography.

Stereoscopic Photographs of Small Specimens.—F. Martin Duncan suggests that in making stereoscopic records of such objects as fossils, etc., a uniform scale of reduction should be adopted, say, distances of 20 and 40 ins. respectively from the lens. Secondly, a separate transparency should be made of a graduated rule on the same standard scale of reduction, so that the object may at any time be approximately measured by laying the scale transparency over the other slide. The author makes an alternative suggestion to the effect that a scale may be photographed together with the object, but he objects to this on the ground that the inclusion of the scale rather spoils the appearance of the slide. It may be suggested that the least objectionable method of including a scale is to use a background faintly ruled in squares together with a "floor cloth" similarly ruled. When photographing small specimens, both background and floor-cloth may consist of a piece of ruled cardboard bent at a right angle. If the specimen is placed right in the angle so that it touches both surfaces, a very good idea of the size of the object in three dimensions can be obtained in the stereoscope.—"Phot. Journ.," Nov., 1909, p. 377; "B.J.," Nov. 26, 1909, p. 910.

Stereoscopic Portraiture.—A. Locket, in further reference to the use of an inclined mirror in the Dixio or Pigeon stereoscope ("B.J.A.," 1910, p. 520), has indicated one or two of the measures desirable in taking advantage of this form of stereoscope for the production of large size stereoscopic portrait prints. The farther the camera is from the sitter, the greater must be the separation or distance between the two lenses, if good relief is required.

This is convenient, because it enables us to use two plates of a good size side by side, either in separate cameras or in a single large camera divided by a central partition. Thus, with a separation of 6¼ in., two half-plate cameras with lenses of 12 in. focus could conveniently be placed in juxtaposition on a single stand. For a half-length portrait the lenses would require to be about 8 ft. from the sitter, and the background about 40 in. behind him. For portraits on a smaller scale, a greater distance between sitter and background is recommended. If, however, it is desired to use a single camera divided by a central partition, as commonly employed for stereoscopic work, a 10 in. x 8 in. camera with square bellows will answer admirably for obtaining either ordinary portraits or study heads, with a separation of about 5 in. Using a 10 x 8 in. plate, two negatives may be secured on the same plate, measuring 8 x 4⅞ in.—a rather pleasing shape. By employing suitable carriers, it is possible with the same 10 x 8 in camera to take two half-plate or smaller size negatives. The 10 x 8 in. camera is more convenient for this purpose than a whole-plate one would be, because half of a whole plate, 6½ x 4¼ in., is somewhat too narrow. There is, however, no objection to this size if it be preferred or the other is not obtainable. The camera front should permit the simultaneous rise or fall of the two objectives, and should also provide for any desired adjustment of the separation. As regards the lenses, if the quality of the results is the only consideration, and price is no obstacle, long focus anastigmats are to be preferred, but excellent work may be done with less expensive objectives.

There are various ways of securing the reversal of the left-hand print. By far the simplest is to use flat films, which may be printed equally well from either side, or the prints may be made by the carbon process, one by single transfer, and the other by double transfer.—"B.J.," Nov. 19, 1909, p. 891.

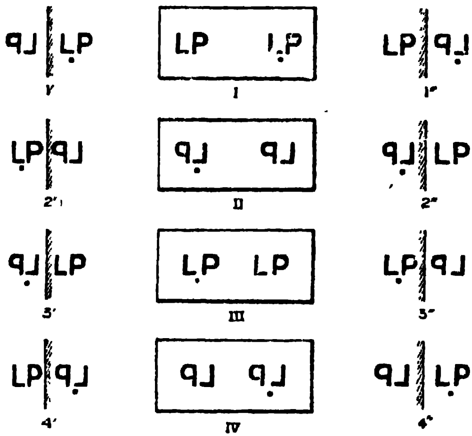
The Dixio Stereoscope.—Professor Pigeon, in replying to two articles in the "B.J." of Dec. 10 and 24, 1909, gives a useful resumé of the different effects which are produced in the Dixio stereoscope according to the manner in which the two prints are placed.

The first two figures represent the conditions giving true stereoscopic effect. In I., central column, there is represented an ordinary stereoscopic pair of prints, each correct as regards right and left, represented by the letters LP. The pictures are assumed to be transparencies on glass. In this pair, and also in the figures which follow, a black dot has been placed underneath the letters LP, representing the right-hand print—that is to say, the one made with the right-hand lens, to distinguish it from that made with the left hand lens.

On the left-hand of the central diagram the figure 1′ will be seen, representing the verso-stereoscopic* pair, which must be pre-

* Pigeon uses "verso-stereoscopic" to describe a pair of prints of which one (*e.g.*, the right) is correct as regards right and left, whilst in the other the subject is reversed as regards right and left

sented to the observer in order that he should obtain, by means of a mirror placed near to his *left* eye, the same result as that in I. As an indication of the position of the mirror the reflecting mirror surface is represented by the black line, the back of the mirror being indicated by the cross-hatching. On the other side of the centre diagram and indicated by 1″, a second pair of verso-stereoscopic prints is represented, namely, that which must be presented



to the observer in order that, by means of a mirror placed near to his *right* eye, he can obtain the same stereoscopic effect as when looking at the ordinary pair I.

In the second line of diagrams, II., 2′ and 2″ represent the ordinary pair and the verso stereoscopic pairs giving stereoscopic effect in a different way. The picture on II. is the same as that above in I., but the observer is assumed to be looking at it from the back, so that letters are reversed and persons appear left-handed.

The positions I., 1′ and 1″ and II., 2′ and 2″ are those which give stereoscopic effect. The remaining arrangements give, on the other hand, a pseudoscopic effect, as shown in figures III., 3′ and 3″ and IV., 4′ and 4″. On comparing I. and III. and then II. and IV. it is seen that, in the case of ordinary stereoscopic pairs, the change is made from stereoscopic effect to pseudoscopic effect simply by changing the position of the prints with regard to each other—that is to say, without changing the side looked at. In the case of ordinary stereoscopic pairs, the change is made from stereoscopic effect, correct as regards right and left, to that reversed as regards right and left, simply by turning round the pair of prints as a whole so as to view them from the back.

It is not the same in the case of pairs of prints intended to be viewed in the Dixio stereoscope. Simple exchange of position between the two prints of a pair, done without making any other change, leaves the effect either of stereoscopy or pseudoscopy, as is seen by comparing, for example, the position of 1′ and 2′, which are two stereoscopic positions; but this exchange does have the effect of producing a reversal of the subject, as regards right and left.

In the case of a verso stereoscopic pair, giving a correct impression as regards right and left, a pseudoscopic effect is obtained simply by changing the position of the mirror, as seen by comparing together 1′ and 4″, 2′ and 3″, 3′ and 2″, and 4′ and 1″.

These facts have already been noted by Pigeon in "Annales d'Oculistique," September, 1906, and they certainly possess much theoretical interest.

In practice among these different positions, there is one, and only one, which is of paramount importance, namely, that represented in 1′, which shows the object in true relief and correct as regards right and left. The pictures, being printed in this way on a single sheet of paper—say the page of a book—are thus fixed in the position which is best. In order to view them, the right eye should regard the print direct, whilst the left eye should view the image reflected in the mirror. This simple condition being fulfilled, no incorrect effects can be observed.—"B.J.," Jan. 7, 1910, p. 14.

Invention of the Stereoscope.—The use of prisms as well as of lenses by Wheatstone is the conclusion from a letter written in 1856 by R. Murray, who during the thirties was carrying out work for Professor Wheatstone. This evidence of Wheatstone's priority is dealt with in "B.J.," Feb. 18, 1910, p. 115.

Stereoscopic Views of Distant Subjects.—J. Krug gives the conditions which must be fulfilled when making stereoscopic prints of very distant objects so as to obtain relief. The exposures must be made with a lens-separation many times greater than that for normal subjects, the camera being bodily moved to a fresh station after making the first exposure. To obtain satisfactory results—

1. The axis of the optical system must pass through the same point of the object in each of the two views.

This condition is easily secured by noting a particular point in the centre of the subject and seeing that it comes in the centre of the ground glass or of the finder when taking each view.

2. The two stations must be on the same level, though a difference in level is negligible if it does not exceed one-thousandth part of the distance of the nearest plane in the view.

3. The stations must be at the ends of a base that can conveniently be set out.

Here it is necessary to consider not so much the distance of the subject from the operator as the relative distances of the two planes which are to be differentiated by an appearance of relief.

If the subject comprises a group of mountain summits from five to six kilometres away, it will be necessary, in order to differentiate between them, to employ a much larger base than if the subject

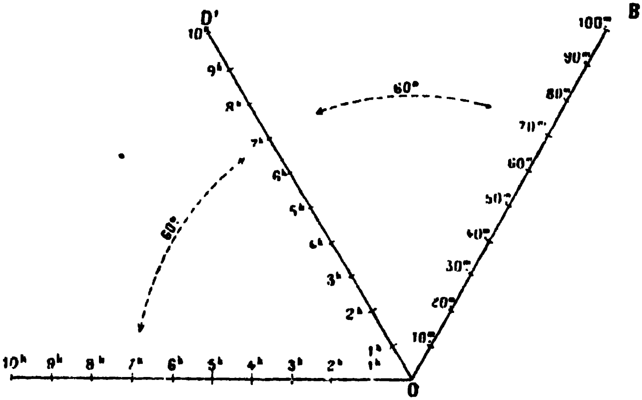
comprised the same group with the nearest crest only two kilometres away. If, in the second case, the same separation is used as in the first, we run the risk of obtaining a very exaggerated effect of relief.

The separation E, that is the distance between the camera positions, for two planes, D^1, the nearest, and D^2, the farthest away, is given approximately by the formula

$$E = \frac{D^2 \times D^1}{100\ (D^2 - D^1)}$$

This is not an absolute formula, as all acquainted with the stereoscope will understand.

In practice we get our results from a diagram constructed as follows :



On OD^2 we find the distance of the farthest plane and join it by a straight line with the distance of the nearest plane marked on OD^1. This line prolonged will cut OB, and we read off on OB the length of the required base in metres.

It will be noticed that if the plane D^2 is at infinity then as a consequence the base must be 1-100th part of D^1. For example, for a village at a distance of 1 km. to stand out in front of a background of mountains at 12 kms. the base to be used must be 10 metres.

When the subject is near it is especially important to see that the base line is so directed as to form the base of an isosceles triangle, of which the two sides are formed by the optical axis.

When using the formulæ or diagrams for telephoto or long focus lenses, take as the separation of the two stations the result

given divided by the focal length employed expressed in decimetres.

For example, if the table gives a separation of 80 metres, and we use a focus of 40 cms., we take as the base $\frac{80}{4}$ or 20 metres.

—"Bull. Soc. Fr. Phot.," July, 1910, p. 229; "B.J.," Aug. 5, 1910, p. 589.

Multiple-Picture and Stereo Transparencies.—M. Estanave has shown how the parallax principle of producing stereoscopic relief without a stereoscope may be used for obtaining transparencies, which appear as quite distinct pictures according to the point from which they are viewed, and how this result may be combined in the same transparency with the appearance of stereo relief.—"B. J.," Aug. 12, 1910, p. 605.

IV.—NEGATIVE PROCESSES.

THE WET COLLODION PROCESS.

Effect of Strong Bath.—Fog, spots, and insensitiveness are caused by too strong a silver solution. The extra strength may come about when boiling down a bath to remove the excess of alcohol and ether and then adding it to another bath without dilution. Far more trouble is caused by a bath containing too much silver nitrate than one containing too little, as the stronger occurs so seldom; when it does happen, the cause of the trouble often takes a considerable time to locate.—"B.J.," Jan. 21, 1910, p. 47.

The Gelatine-Bromide Process.

Renovating Stale Plates Before Exposure.—R. H. Baskett has found that plates which through age show a metallic border round their edges may be treated before exposure by rubbing with cotton wool prepared with a little salad oil and Globe polish. This removes the markings on the plates, and the negatives obtained are free from stain round the edges, and are generally very satisfactory as regards absence of pinholes. Mr. Baskett thinks that plates would be improved by this treatment, which he states to result in increased speed and absence of halation.—"Phot.," Mar. 1, 1910, p. 178.

Orthochromatic Processes.

Colour-Sensitising Plates.—R. Namias recommends the following sensitising bath, containing half its bulk of 95 per cent. alcohol, on the grounds that it penetrates the film sufficiently, but does not require elaborate drying methods. The formula is :—

Ethyl-violet (Badische)	1 gm.
Erythrosine	0·5 gm.
Alcohol, 95 per cent.	500 c.c.s.
Water (distilled)	500 c.c.s.

For use 2 c.c.s. of this bath are mixed with 0·5 c.c. of ammonia and 100 c.c.s. of distilled water.

Extra rapid plates are bathed in this for fifteen minutes in absolute darkness. They are then placed to wash in running water for a few minutes and then put for one minute in 95 per cent. alcohol.

On transference to a calcium-chloride drying box they are dry and ready for use in two or three hours. The alcohol can be used several times, it being necessary only to replenish it from time to time with a fair proportion of fresh alcohol of 95 per cent. The alcohol bath becomes strongly coloured. This colouration does not mean that the alcohol is dissolving a large quantity of the dye, but arises from the fact that the isocyanine dyes colour alcohol much more strongly than water.—"Photo-Revue," Feb. 20, 1910, p. 58; "B.J.," Colour Supplement, April 1, 1910, p. 28.

Destroying Colour-Sensitiveness in Developer.—E. Stenger and F. Leiber have made experiments to discover whether the use of a preliminary bath of metabisulphite ("B.J.A.," 1909, p. 652) or weak sulphuric acid is of advantage in so reducing the colour-sensitiveness of panchromatic plates that they can be developed in a bright red or yellow light. They find that metabisulphite greatly alters the gradation given by the plate, whilst the fog produced when a bright red light is used in the dark-room is several times that produced by a dark red light without the use of the metabisulphite. In the case of a weak preliminary bath of sulphuric acid, as recommended by Krayn ("B.J.A.," 1910, p. 525), gradation and time of development are not affected, but a certain amount of fog is produced, compared with development in the ordinary way in the dark.—"Atelier," Jan., p. 11, and Feb., p. 19, 1910; "B.J.," Jan. 28, 1910, p. 61.

Developing Panchromatic Plates by Inspection.—Sydney H. Carr finds that a 5 per cent. solution of potassium metabisulphite applied in the dark to the panchromatic plate for thirty seconds allows of development afterwards in yellow light. The plate should be kept in the dark while rinsing it for ten seconds under the tap and until the developer has been poured on and allowed to act for, say, a minute.

Or, in place of the metabisulphite, 5 drops of soda bisulphite liquor per ounce of water may be used for thirty seconds, the after-treatment being as just mentioned.—"A.P.," Nov. 23, 1909, p. 504.

LIGHT-FILTERS.

Graded Light-Filter.—Arising out of a statement that a graded light-filter—that is, one varying from a deep tint at the top to a light one at the bottom—has the same effect as a screen of even tint, it is pointed out that this is only the case when the stop is in front of the lens and the filter at the stop, and then only up to the angle at which cutting off by the mount commences. Beyond this angle the grading of the filter affects the result. The assumption that when used, as it ordinarily is, in front of the front lens of a large-aperture R.R., or anastigmat lens, the filter is without effect, is based on disregard of the fact that all the pencils of light which strike the filter do not reach the plate, since certain of them are cut off by the stop of the lens or by the hinder part of the lens mount. This cutting off commences at a quite moderate angle.

In practice also the graded filter has been found very efficient in giving greater exposure to the foreground than to the sky.—"B.J.," June 10, 1910, p. 430.

Testing the Flatness of a Light-Filter.—Dr. C. E. K. Mees describes how the flatness of glass for the making of an orthochromatic light-filter is readily tested when selecting pieces or parts of pieces for coating with dyed gelatine or for the support of a dyed gelatine film. A piece of cardboard, from which white cross-lines have been cut out, is placed so that it is well illuminated, and the image of the cross reflected in the filter is observed by holding the filter down and looking into it at the illuminated cross. When you examine, *e.g.*, a yellow filter in this way, you will see two images of the cross, one coming from the front surface, which will be white, and another coming from the back surface, quite yellow. If, as you move the filter about so that the cross falls on different portions of the filter, these two images remain constant with regard to each other, then the filter is only wedge-shaped, and the double image does not matter, but if they vary with regard to each other, then the filter is not satisfactory, and will produce distortion to some extent. Commercial filters at low prices cannot be made of the accuracy of lenses, but all filters should fulfil this test to this degree.—"Process Year-Book, 1909-10," p. 153.

Sensitometry, etc.

Resolving Power of Dry Plates.—Dr. C. E. K. Mees has investigated the "resolving power" of gelatine dry plates, "resolving power" being defined as the distance which must separate two lines of light falling on the plate in order that the developed image may be recognised to be that of two separate lines. Thus, in practical work, resolving power means the rendering of extremely fine detail by the plate—distinct, of course, from the resolving power of the lens, which may be greater or less than that of the plate, according to the instrument.

The method of investigation consisted in photographing (on the plate being tested) a very fine illuminated slit, before which was placed a wedge of neutral black glass, so that the intensity of the illumination of the slit fell off throughout the length from about 60 to 1. The slit was 9 x 1 mm., and was photographed on a scale of 1-22nd, the image on the plate being thus 0.5 mm. high and 0.055 mm wide. The slit was crossed by ruled black lines at intervals of 1 mm.; these are shown in fig. 4. In order to ensure absolute coincidence between the image focussed and the surface of the plate, a rigid camera was constructed of brass tube containing a spectroscope objective of 6 in. focal length with a slow motion focussing arrangement. The back of this camera consisted of a brass plate with an aperture 1 in. in diameter, against which fitted the equally flat brass front of the dark slide. This rigid camera was fitted to one end of a square box of 6 in. section

and 11 ft. long, at the other end of which the slit was placed illuminated by means of a Nernst burner and condenser with a sheet of ground glass.

Owing to the graduated intensity of the slit, the tiny image thus formed, in consequence of the spreading of light by the film of the plate (irradiation), assumed a tadpole-like shape.

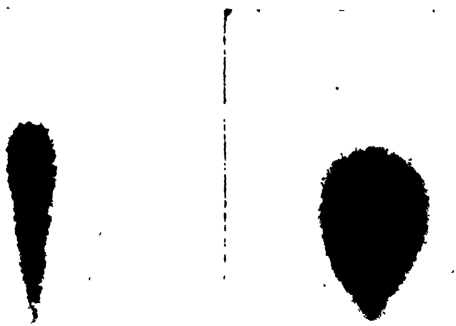


Fig 1. Fig. 2.

In order to measure the actual resolving power of the plates, ruled gratings with lines of various widths were substituted for the slit, and the gratings were changed until it was found that a given grating was just resolved into lines.

The experiments have shown that the resolving power is greatest in a transparent film such as that used for the Lippmann plate. In the case of the various gelatine dry plates, the much lower resolving power is due to irradiation of two kinds :—

1. That due to reflection of light among the grains of the plate. This occurs more in plates of coarser grain; to a much less extent in those of fine grain.

2. That due to diffraction, and active chiefly in plates of fine grain; to a small extent only in those of coarse grain.

The production of irradiation by diffraction was shown by the fact that this kind of irradiation varies with the colour of the light, whereas that due to reflection is the same for lights of different wave-length.

As will be understood from the conflicting character of the two kinds of scatter, the best degree of resolving power is given

by plates which are of medium fineness of grain. Thus, a process plate, the grains in which measure from 0.001 to 0.0015 mm. gives much higher resolving power (fig. 1) than a chloro-bromide plate, the grains in which are 0.0008 mm. (fig. 2). Fig. 3 shows the "tadpole" obtained on an extra rapid plate, and fig. 4 that on the Lippmann film.

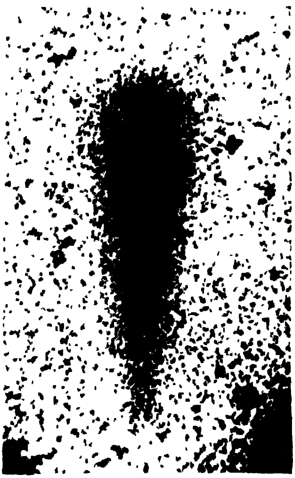


Fig. 3.

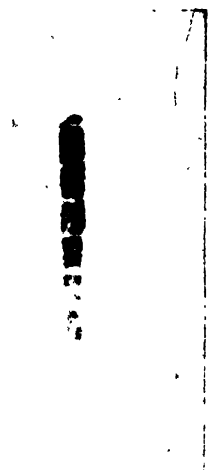


Fig. 4.

The following results were obtained:—

Plate.	Colour of light.	Grain diameter mm.	Distance apart of lines just resolved. mm.
Extra Rapid	White	0 0015 to 0·004	0·030
Process..........	White	0·0010 to 0 0015....	0·018
Lantern	Violet	0·0004	0·018
	Red ...	0·0004	0·008
Special High Resolution	Violet	0·0004	0·008
	Red	0·0004	0·004
Lippmann	Violet	0·0001 (?)	0·004
	Red	0·0001 (?)	0 002

No difference was noticed between backed and unbacked plates as regards resolving power. In the case of fast plates, the results, within wide limits, are not affected by the thickness of the film, but with slow plates, the thinner the film the greater the resolving power.—"Proceedings of the Royal Society," A., vol. 83, 1909, p 10; "B.J.," Dec. 24, 1909, p. 989.

Dr. W. Scheffer, in opposition to the results obtained by Dr. Mees, has found that the resolving power of fine-grained plates was not affected by the colour of the light. Mees has, therefore, repeated those experiments with an apparatus similar to that used by Dr. Scheffer, a microscopic objective of 35 mm. focus being used instead of the 6-in. focus spectroscopic objective originally employed. This lens gave images in which the resolving power of the pinacyanol-bathed lantern plates used appeared to be the same for blue light and for red light, but the results were not quite conclusive because while the microscopic objective had the advantage of higher numerical aperture, and, therefore, higher optical resolving power, it had only a very small depth of definition, and, therefore, the definition of the image was not the same throughout the film.—"B.J.," Jan. 14, p. 24; June 17, p. 453; July 29, p. 576; and Sept. 9, p. 678, 1910.

Determining Plate Speeds.—A paper from the research laboratories of Messrs. Ilford, Limited, deals with the irregularities caused in plate-speed determination by intermittency of exposure when using a sector-wheel exposing machine, and by the acetylene standard light. The latter gives rise to discrepancies owing—among other causes—to the quite appreciable colour-sensitiveness of plates commercially manufactured and sold as "ordinary."—"Phot. Journ.," April, 1909, p. 164; "B.J.," April 29, 1910, p. 324.

F. F. Renwick, in referring again to these matters in a paper before the International Congress, suggests that a liquid cell of solution of metallic salts should prove a more satisfactory filter than one of dye for giving the acetylene standard the spectral quality of daylight.—"B.J.," Aug. 19, 1910, p. 626.

The Densograph.—Dr. E. Goldberg has devised a method of obtaining the characteristic curve of a plate without plotting densities against exposures in the usual way.

The following is the principle of the instrument:—Let a prism of the Lummer-Brodhun type be placed so that in one direction it faces a prism of black glass, whilst in a direction at right angles it faces the plate to be measured. If in any given position of the prism the two halves of the field are equally illuminated, this condition means that the prism itself lies on the characteristic curve of the plate. If a pencil, to which pressure can be applied, is attached to the prism, the pencil will inscribe on paper lying beneath it a point forming part of the characteristic curve.

By displacing the prism in such a way that the two halves of the field remain continuously the same, the pencil will automatically draw the curve of the plate. These conditions are represented as realised in the figure, where *e* represents the prism of black glass, *u* the photographic negative (both in section), and *b* the Lummer-Brodhun prism, the faces of which are directed towards *e* and *u*. Other positions of the prism are indicated at *b′* and *b″*, both of which, when the two halves of the prism are equally illuminated, will lie on the characteristic curve.

The instrument, constructed for making measurements in this way, is named the Densograph, and is made from Dr. Goldberg's

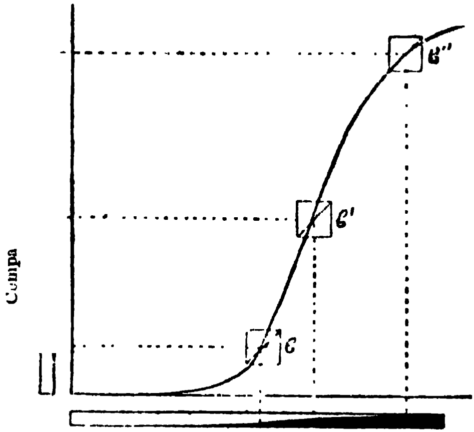


Plate *v*.

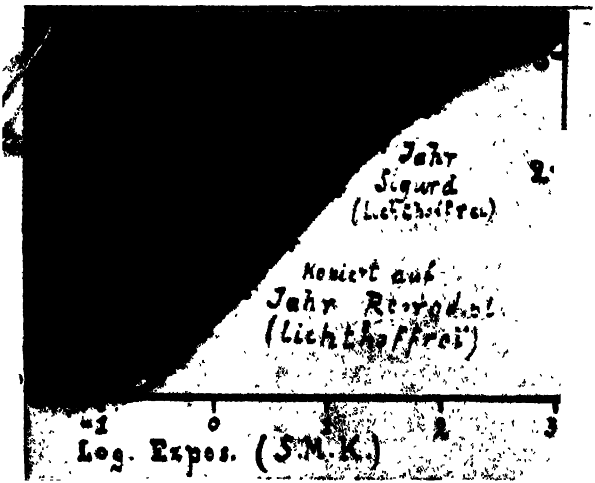
designs by Messrs. Schmidt and Haensch, Berlin.—"B.J.," Aug. 26, 1910, pp. 649 and 643.

Wedge Screens for Sensitometric Work.—Dr. E. Goldberg has described the method worked out by himself for preparing neutral wedge screens of gelatine containing the neutral "lamp-black" water-colour of Winsor and Newton. These are used in place of the costly black glass prisms.—"B.J.," Aug. 26, 1910, p. 649.

The screens are supplied commercially by Messrs. Ilford, Limited. —"B.J.," Sept. 2, 1910, p. 675.

Obtaining the Curve of a Plate Automatically.—Dr. R. Luther, in a paper before the Brussels Congress, described a method by which the characteristic curve of a plate can be obtained automatically without any measurements whatever. A square, black wedge prepared by the method given by Dr. Goldberg (see "B.J.," Aug. 26, 1910, p. 648) is taken, and a plate exposed in contact with it; this plate, after development, is then placed again on the black wedge at right angles to its direction during exposure. As a result, the density of the wedge added to that of the plate produces a series of lines of equal density, and these lines have the form of the characteristic curve of the plate. If a hard-working slow plate be now exposed behind the combined negative and wedge it is possible to get a positive of which the boundary between the opaque and transparent portions represents the characteristic curve of the original plate. This method is really only successful with hard-

working plates, it being almost impossible to get a flat plate to give a sufficiently sharp boundary, but it is a very simple and complete demonstration of the principles governing the production of the



characteristic curve of a plate, and should be of considerable use to teachers. The reproduction shows a curve of a plate obtained by Luther's method.—"B.J.," Aug. 26, 1910, p. 643; Dr. Luther's full paper is given in "B.J.," Sept. 2, 1910, p. 664.

The Latent Image.—Dr. R. Luther, before the Brussels Congress, presented a report on the present knowledge of the nature of the latent image, giving the reasons for and against the theories of a silver sub-haloid and a silver latent image respectively. He added a list of the directions in which future investigations might be made.—"B.J.," Aug. 26, 1910, p. 651.

Photographs by Ultra-violet Light.—Professor R. W. Wood has described experiments in photography with these rays alone, using quartz lenses. Some white pigments, *e.g.*, "Chinese white" (zinc white), photograph quite black by ultra-violet light. Highly polished silver reflects only about 4 per cent. of the ultra-violet light.—"B.J.," Aug. 12, 1910, p. 610.

Developers and Development.

DEVELOPERS.

Developers for Hot Countries.—L. J. Bunel has worked out developers which may be used without having resource to ice, and

in compounding which a more stable alkali than sodium carbonate is used, namely, borax. The formulæ are :—

Diamidophenol Developer.

A.—Diamidophenol	10 gms.	180 grs.
	Potass. metabisulphite	25 gms.	1 oz.
	Potass. sulphate	50 gms.	2 ozs.
	Water	500 c.c.s.	20 ozs.
B.—Borax		40 gms.	700 grs.
	Potass. bromide	1 gm.	18 grs.
	Potass. sulphate	50 gms.	2 ozs.
	Water	500 c.c.s.	20 ozs.

At the moment of use equal parts of A and B are mixed together to form the developer. The solution A will keep at least two weeks without special precaution, and becomes only slightly coloured.

The addition of a few c.c.s. of acetone quickens the bath to a marked extent; it is convenient to add also at the same time an equal quantity of 10 per cent. potass. bromide solution—that is, in the case of negatives somewhat under-exposed.

Metol-Hydroquinone Developer.

Hydroquinone	5 gms.	44 grs.
Metol	5 gms.	44 grs.
Potass. sulphate	100 gms.	2 ozs.
Acetone	50 gms.	1 oz.
Borax	50 gms.	1 oz.
Potass. metabisulphite	25 gms.	½ oz.
Water	1,000 c.c.s.	20 ozs.

In place of the borax and potass. metabisulphite in the above formula the following may be used :—

Soda sulphite (anhydrous)	75 gms.	1½ oz.
Soda carbonate	5 gms.	44 grs.

If the addition of acetone produces a crystalline precipitate, the mixture should be poured off or filtered.

The bath keeps better if the acetone is added only at the moment of use.

Rapidity of drying being of great importance in order to safeguard the plates from the action of bacteria, plates are given a rinse after development, are fixed for ten minutes, washed in four changes of water for twenty minutes (which was found to remove the hypo), placed for five minutes in spirit, on removal from which they dry immediately.

The fixing bath also hardens the film. The following formula was found to be most satisfactory :—

Chrome Alum Fixing Bath.

Hypo	250 gms.	5 ozs.
Potass. metabisulphite	25 gms.	½ oz.
Chrome alum	10 gms.	90 grs.
Potass. cyanide	5 gms.	45 grs.
Water	1,000 c.c.s.	20 ozs.

The hypo is dissolved in part of the water by heat, the other constituents in the other portion of the water, the two solutions cooled and mixed.

The cyanide is not essential, but it prevents separation of sulphur and keeps the solution clear until exhausted.—"Bull. Soc. Fr. Phot.," May, 1910, p. 174; "B.J.," May 27, 1910, p. 399.

Pyro-Soda which Keeps.—G. T. Harris, writing of the pyro-soda formula on page 733 of the 1910 "Almanac," in place of one of the usual type, writes that he made it up immediately on its publication, and after using it for six or seven months finds it the best and most convenient formula ever published for a pyro-soda developer.

For landscape and architectural work one part of mixed developer is used with two parts of water; for reproduction of negatives, one part of mixed developer and one part of water; for black and white copies, equal parts of the stock solutions. The freedom from staining is really quite remarkable, and its keeping qualities are excellent, as can be seen from the sample sent, which is part of the pyrogallol solution made up nine months ago. Those who have a predilection for pyro-soda as a developer must certainly feel grateful for a most satisfactory formula.—"B.J.," Dec. 10, 1909, p. 961.

[This formula appears among those for developers on page 735 of the present volume.—Ed.]

Pyro and Boric Acid.—A. T. Hall gives the following formula for a cheap developer which can be made up in dilute solution (ready for use) of keeping properties superior to those of strong stock solutions:—

A.—	Water (distilled)	40 ozs.	1,000 c.c.s.
	Potassium metabisulphite	160 grs.	9·1 gms.
	Boric acid (crystals)	20 grs.	1·1 gms.
	Pyrogallic acid	160 grs.	9·1 gms.
	Hydroquinone	10 grs.	0·6 gm.
B.—	Water (distilled)	40 ozs.	1,000 c.c.s.
	Sodium sulphite	2 ozs.	50 gms.
	Sodium carbonate	2 ozs.	50 gms.

For normal exposures, use equal parts of A and B; for extra contrast, use less of B. For soft negatives, use more of B, or make a weaker A solution by mixing the A formula given above with an equal bulk of distilled water.—"A.P.," Aug. 2, 1910, p. 120.

Metol and the Skin.—A number of remedies for the effects of metol on the hands are given in letters addressed to the Editor of the "B.J." The following are one or two stated to have proved efficacious :—

1. Soak the hands in warm water at night, rub in zinc ointment, and wear a pair of gloves to keep the ointment on. Should effect a cure in two or three days. To prevent recurrence, dip the hands frequently in clean water while at work, and at night and morning and meal intervals wash well with soap and warm water.

2. The homœopathic (internal) medicine, "Graphites 30," one tablet to be taken night and morning.

3. An ointment made as follows :—

Ichthyol	1 part.
Resorcin	1 part.
Glycerine	1 part.
Zinc oxide	1 part.
Paraffin ointment	6 parts.

—"B.J.," Sept. 2, p. 674, and Sept. 9, p. 695, 1910.

Concentrated Metol-Hydroquinone Developer.—R. L. Boyd recommends the following formula for a very concentrated M.Q. developer :—One part diluted to seven parts of water still contains 3 grains of hydroquinone and ¾ grain of metol per ounce.

The formula is as follows :—Warm water, 4 ozs.; metol, 24 grs.; hydroquinone, 96 grs. When dissolved, add soda sulphite (crushed small), 1½ ozs. By the time the sulphite is dissolved, the whole will be a white, pasty mass. Now add 64 grs. of sodium hydrate (caustic soda), shake well, and in a minute or so you will have a clear concentrated M.Q. solution. One dr. of this, added to 7 drs. of water, will make a developer containing in each ounce :—Metol, ¾ gr.; hydroquinone, 3 grs.; sodium sulphite, 20 grs.; sodium hydrate, 2 grs. Can be used half strength for most purposes.

The image appears in 5 to 8 seconds; development usually complete in 1½ or 2 minutes; factor, about 16. Diluted 1 dr. to 2 ozs. of water and 2 drops of bromide added to each ounce, it makes a first-rate bromide paper developer. The strong solution keeps very well indeed.—"B.J.," Nov. 19, p. 906, and Nov. 26, p. 927, 1909.

Metoquinone.—MM. Lumière have given revised formulæ for the use of the metoquinone manufactured by them.

For time exposures the following solution is used, the metoquinone being first dissolved, and then the anhydrous soda sulphite:—

Water	1,000 c.c.s.	20 ozs.
Metoquinone	5 gms.	44 grs
Soda sulphite anhydrous*	30 gms.	130 grs.

For snapshots the above formula may be used, but it is better to prepare a somewhat more energetic developer by the addition of a small proportion of alkali, or of a substitute for an alkali, in accordance with one or other of the following formulæ:—

* Or, crystal, 60 gms. (260 grs.).

1.—Water	1,000 c.c.s.	20 ozs.
Metoquinone	5 gms.	44 grs.
Soda sulphite anhydrous	30 gms.	130 grs.
Soda carbonate anhydrous	5 gms.	44 grs.
Potass. bromide, 10 per cent. solution	10 c.c.s.	1½ drs.
2.—Water	1,000 c.c.s.	20 ozs.
Metoquinone	5 gms.	44 grs.
Soda sulphite anhydrous	30 gms.	130 grs.
Potass. bromide, 10 per cent. solution	10 c.c.s.	1½ drs.
Acetone	10 c.c.s.	1½ drs.
3.—Water	1,000 c.c.s.	20 ozs.
Metoquinone	5 gms.	44 grs.
Formosulphite, Lumière	30 gms.	130 grs.

The three formulæ give practically the same results. No. 1 is the least expensive, Nos. 2 and 3 are not quite so advantageous in this respect as No. 1, but they avoid the use of an alkaline carbonate, and are therefore particularly recommended for use in hot countries or during hot weather in Europe.

For under-exposed negatives one or other of the above formulæ given for snapshots is used, diluting 1 part of developer with 2 parts of a solution of carbonate of soda containing 5 gms. per litre.

For over-exposed plates the single solution developer given for time exposures is employed, but with the addition of 10 per cent. bromide solution to the amount of from 2 to 20 c.c.s. per litre of developer (= 20 minims to 3 drams per 20 ozs.). As a developer for lantern-plates, where a black tone is required, the first formula given above, namely, that for time exposures, may be used, or No. 1 and No. 2 of the formulæ for snapshots. Of these No. 1 gives somewhat softer results than No. 2.

The great solubility of metoquinone in acetone allows of a very concentrated solution being prepared by taking advantage of this fact. This is as follows:—

Water	700 c.c.s.	25 ozs.
Soda sulphite anhydrous	120 gms.	4 ozs. 102 grs.
Acetone	160 c.c.s.	5½ ozs.
Metoquinone	32 gms.	1 oz. 55 grs.

The metoquinone is dissolved in the water at 105°F., after having added the sulphite and acetone. This developer is mixed with nine times its bulk of water to form the working solution.

Stand Development.

The facts that metoquinone may be used with an alkali and that the solution keeps excellently render it a most ideal substance for stand development. The following is a very suitable formula, due to M. F. Dillaye:—

Water	4,000 c.c.s.	140 ozs.
Metoquinone	5 gms.	80 grs.
Soda sulphite anhydrous	50 gms.	1¾ oz.
Potass. bromide, 10 per cent. solution	5 c.c.s.	85 minims.

The negatives should be turned over in this solution at the end of every quarter of an hour, and well washed between developing and fixing; the total time of development will be about an hour, and the fixing bath is preferably one of "acid" formula.

Three-Dish Development.

In developing a large number of negatives, the correct exposure of which in many cases is uncertain, metoquinone may be usefully employed by making up three separate developers, each of a different degree of activity. A great number of formulæ might be given for working upon this system, but the following is as simple as any:—

For dish No. 1 developer for over-exposed negatives } See above.
For dish No. 2 developer for snapshots.
For dish No. 3 developer for under-exposures.

Commence development in dish No. 1, and if there are no signs of over-exposure withdraw the plate, and continue development in No. 2; or, if it shows signs of under-exposure, remove it to No. 3.—"B.J.," Dec. 31, 1909, p. 1,008.

Bromide and Hydroquinone Developer.—A. and L. Lumière and A. Seyewetz have made experiments to determine the effect of bromide compounds and other restrainers, using for the purpose a hydroquinone developer prepared with potass. carbonate (17 grs. per oz.) and anhydrous soda sulphite (11 grs. per oz.). The quantity of hydroquinone per oz. was 4½ grs. It was found that all the soluble bromides, such as potass. bromide, gave comparable results, whilst chlorides, iodides, and fluorides gave no perceptible effect as regards increase of contrast. The iodides, in fact, reduced contrast. Other bodies, such as potass. ferrocyanide and ferricyanide, potass. bichromate and the common acids, although in some instances prolonging development, did not produce appreciable increase of contrast.

In the case of the non-alkaline developers, of which diamidophenol is a type, a small quantity of bisulphite of soda lye of 40 per cent. strength (2 to 5 c.c.s. per 100 c.c.s. of developer) was found to accelerate development instead of retarding it, and to produce not an increase, but a very appreciable reduction of the contrasts. With more than 5 c.c.s. of the bisulphite lye, the time of development increases with the quantity of bisulphite, and up to a dose of the lye of 15 c.c.s. the contrasts increase, but to a much smaller extent than by addition of bromide. If too little or too much bromide is added to the diamidophenol developer, the influence of the bromide is then inappreciable; no doubt this fact is responsible for the mistaken ideas prevalent in regard to the action of bromide with this developer. On the other hand, the bromide exerts a very marked action when the proportion added is kept between 0.5 to 1 gm. per 100 c.c.s. of developer.—"Bull. Soc. Fr. Phot.," April, 1910, p. 148; "B.J.," May 13, 1910, p. 361.

Diamidophenol Developer with Boric Acid.—R. Namias recommends the addition of boric acid in place of bisulphite liquor to the diamidophenol developer. The boric acid is said to be preferable,

since it does not reduce the energy of the developer. It renders the developer much more sensitive to the restraining action of bromide. A suitable formula is

Sodium sulphite, cryst.	40 gms.	350 grs.
Boric acid, powder	50 gms.	1 oz.
Diamidophenol (hydrochloride)......	5 gms.	45 grs.
Water	1,000 c.c.s.	20 ozs.

—"B.J.," Oct. 22, 1909, p. 820.

(It is pointed out editorially on page 814 of the same issue that diamidophenol developer made up with acid sulphite does not give weak results, but is an excellent formula, for example, for vigorous prints of rich black tone on bromide paper.)

Acid Diamidophenol Developers.—When using metabisulphite in place of acid sulphite, in accordance with the previous paragraph, the formulæ given by Underberg for hard, normal, and soft negatives may be made up as follows :—

—	Underberg's Formulæ.			B. J. Formula.
	Hard.	Normal.	Soft.	
Diamidophenol.................	25 grs.	25 grs.	10 grs.	20 grs.
Sodium sulphite	160 grs.	300 grs.	120 grs.	240 grs.
Potassium metabisulphite ...	117 grs.	62 grs.	2 grs.	30 grs.
Potassium bromide	25 grs.	13 grs.	4 grs.	2½ grs.
Water to	10 ozs.	10 ozs.	10 ozs.	10 ozs.

The formula in the fourth column is that recommended for general work by the "British Journal," and is included among the developers given on another page in the "Formulæ for the Principal Photographic Processes."—"B.J.," Dec. 31, 1909, p. 1,007.

Acid Sulphite v. Metabisulphite.—In making up the diamidophenol or amidol developer in the acid form (see "B.J.A.," 1910, p. 529) metabisulphite is a convenient substance to use in place of the acid sulphite lye. The latter is usually taken as a 40 per cent. solution of sodium bisulphite, and we may therefore take it as roughly equivalent to a 20 per cent. solution of sodium metabisulphite, which in its turn may be considered to be nearly equivalent to a 24 per cent. solution of potassium metabisulphite. This is a stronger solution than can be made, as potassium metabisulphite is not very soluble; we can, however, make a 6 per cent. solution and take four times as much of it as we are told to take of the acid sulphite solution. One cubic centimetre of the acid solution may then be considered to be equal to 4 c.c.s. of 6 per cent. potassium metabisulphite, or ·24 (one-quarter) of a gramme.—"B.J.," Dec. 31, 1909, p. 1,006.

Keeping Sulphite.—Dr. J. H. Wigner has found that mannite is practically useless as a preservative of sulphite. It reduces oxida-

tion, but does not prevent it. Since mannite costs nine shillings a pound, whilst sulphite is less than sixpence a pound, it does not pay to use 1 per cent. of mannite to preserve a 5 per cent. solution of sulphite. Dr. Wigner confirms the experiments of others as to the useful preserving power of hydroquinone for sulphite. A 5 per cent. solution of sulphite kept well with the addition of one-twentieth per cent. of hydroquinone, so that one part of the latter compound sufficed for 100 parts of sulphite.—"A.P.," Dec. 7, 1909, p. 550.

Commenting on these results, a writer in the "British Journal" says:—The cost of preservation in this case is very different, for, in round figures, we may say that one pennyworth of hydroquinone will preserve six pennyworth of sulphite, whereas in some old experiments of our own we found that about six pennyworth of mannite was required to preserve only one pennyworth of sulphite, and even then the advantage was not very substantial. It would seem that before adding the hydroquinone it would be just as well to dispose of any carbonate existing in the sulphite by adding an acid, sulphuric, for example, until the solution is neutral to phenolphthalein. The carbonate can do no good, and it is quite possible that the hydroquinone will be even more efficient in the absence of any alkaline salt.—"B.J.," Dec. 17, 1909, p. 966.

H. Jeffreys, as the result of experiment on the keeping qualities of sulphite, advises that the latter be made up in as strong a stock solution as possible. He finds sulphite to keep well with sodium carbonate in the same solution (compare "B.J.A.," 1908, p. 625, also "B.J.A.," 1907, p. 751, for sulphite solution which keeps). Two stock solutions recommended by Mr. Jeffreys are as follows:—

1.	Sodium sulphite (crystals)	4 ozs.
	Hot water	to 10 ozs.

Bottle, and allow to stand. Some of the sulphite will crystallise on cooling, leaving a clear saturated solution, which may be taken to contain about 32 ozs. crystallised sulphite or 16 ozs. anhydrous sulphite per 100 fluid ozs. of solution.

2.	Sodium sulphite crystals	2 ozs.
	Sodium carbonate crystals	2½ ozs.
	Water	to 10 ozs.

As this is not quite saturated, its strength remains perfectly constant during changes of temperature. It is an excellent "B solution" for pyro-soda developer.—"B.J.," Apr. 29, 1910, p. 320.

Anhydrous Sulphite.—Elias Elvove, in a paper in the "American Journal of Pharmacy," records experiments showing the greatly superior qualities of anhydrous soda sulphite in comparison with the crystallised salt as regards keeping in the solid state in stoppered bottles. The anhydrous sulphite remains practically unaltered, whereas the cryst sulphite in a few months was found to lose about one-fifth of its sulphite. The author points out that the anhydrous sulphite supplies an excellent means of preparing concentrated sulphurous acid, from which, again, a very pure sodium bisulphite lye, or even a solid sodium bisulphite, can be

made.—"American Journal of Pharmacy," May, 1910, p. 211; "B.J.," July 15, 1910, p. 531.

TIME DEVELOPMENT.

(Thermo-Development.*)

Time Development.—C. E. K. Mees and S. H. Wratten, after illustrating the way in which the development process progressively produces contrast in the negative, point out that the law of development is :—

The rate of development at any time is a constant (known as the velocity constant) multiplied by the difference between the limiting maximum contrast and the contrast already attained.

The extent to which development has progressed at any time therefore depends on TWO DIFFERENT factors, the *maximum contrast,* which a plate will give, *and* a *velocity constant* depending on various circumstances.

The application of any rule, found for one batch of a particular plate to further batches of that plate, depends on the constancy of the two factors from batch to batch. The authors have measured these factors in the case of their own plates for a period of four years, and have found that the maximum contrast of a plate is reasonably constant from batch to batch; it is, of course, the object of the emulsion-maker to keep it so. Varying circumstances do, however, introduce considerable variations, amounting in extreme instances to 30 per cent. or 40 per cent.

The chief of such circumstances are :—

1. Sudden changes of weather during the making of the emulsion.
2. Sudden changes in the water supply due to heavy rains.
3. Changes in the gelatine used.

The velocity constant of development (at the same temperature, and for the same developer) varies very greatly with different batches of the same plate. This is mainly conditioned by the rate at which the plates dry, which, even in completely artificial drying systems, such as those used by plate-makers, is always affected to some extent by external weather conditions. Moreover, any change in the gelatine always affects this factor at once.

Measurements made of different batches of various other commercial plates confirmed these results. Thus, in the case of two batches of one plate purchased at the same time, one took four minutes and the other seven to develop to the same degree of contrast.

Generally, it is quite unsafe to deduce the time which a plate will require for development from previous experience with other batches of the same plate if any appreciable time has elapsed since those batches were made.

It is usual, in systems proposed for the development of plates by time, to provide for a correction to be applied for other temperatures of the developer than the "standard" one. Such corrections

* *i.e.*, development, the length of which is modified (by calculation) to allow for variations in the temperature of the developing solution.

are usually based on a so-called "temperature co-efficient" of the developer, which corresponds to the variations in the velocity constant of development with that developer, produced by variations in the temperature. All such corrections, consequently implicitly contain the assumption that the temperature co-efficient of a developer is independent of the plate employed.

But it is found that—

1. The effect of temperature is greatly dependent on the plate.

2. It does not vary appreciably between different batches of the same plate.

3. It is usually much larger in the case of slow than of fast plates, but this is not necessarily true.

4. In the case of some plates the effect of temperature within wide limits may be very small instead.

5. The temperature co-efficient of a developer for the same batch of plates is constant only within small limits of temperature.

It, therefore, follows that tables giving corrections for temperature are not of practical use in calculating the time of development for commercial plates.

The considerations set forth above, therefore, lead to the following conclusions :—

1. That the calculation of the time of development of plates by the aid of tables is likely to be misleading in consequence of the variation of the governing factors with different batches of the same plate.

2. That correction of the calculation for varying temperatures is also likely to be misleading in consequence of the wide variation between the effects upon different kinds of plates.

3. That development of a plate to a fixed degree of contrast by time alone can only safely be practised if the temperature correction be known for the plate used, and the maximum contrast and velocity constant for the particular batch used.

This latter condition leads to the following conclusion :—

Development by time can only be successfully and accurately accomplished if the time required for development is found for each batch of plates, either by the maker or the user.

As regards factorial development, in which the image is first observed and a multiplier used to give the time of total development, variations due to temperature or differences in the plates are automatically compensated for.—"B.J.," May 20, 1910, p. 376.

Alfred Watkins, writing in reference to the classification of commercial plates as regards speed of development, points out that different batches of a given brand of plate often vary greatly in this respect, and all such information must be verified by a trial.

There are two ways of making the necessary allowance for different brands of plates. The one is to keep to a standard dilution of developer and *vary the time* for different groups of plates; the other way is to keep to a standard time and *vary the dilution* of the developer for different plates. In the new Watkins time thermometer the latter plan is adopted, as it leaves the time variation for changes of temperature only.—"A.P.," May 17, 1910, p. 486.

Alfred Watkins describes the making of a table of times for the use of a given developer at different temperatures.—"A.P.," May 24, 1910, p. 509.

Alfred Watkins has patented a thermometer, the scale of which is graduated, not into temperatures, but is a logarithmic scale of times for development at the various temperatures indicated by the height of the mercury.—Eng. Pat. No. 12,120, 1909; "B.J.," Dec. 24, 1909, p. 996.

SIMULTANEOUS DEVELOPMENT AND FIXING.

Combined Development and Fixing.—V. Cremier recommends the following formula :—

Diamidophenol	1 gm.	15 grs.
Soda sulphite anhydrous	5 gms.	80 grs
Hypo solution 1 : 5, as ordinarily used for fixing	10 c.c.s.	5 drams.
Water	100 c.c.s.	3½ ozs.

The proportion of hypo prescribed is that found necessary to ensure proper fixation of richly coated plates in about 10 or 15 minutes.

In working by the combined method 3½ ozs. of the bath given above is used for a plate up to 7 x 5 inches in size. For larger plates a larger quantity of solution should be used in order to ensure complete fixation. With a normal exposure the image appears in about 30 seconds, and is completely developed and fixed in about 15 minutes. Care should be taken to continue the process until all trace of the white unexposed silver bromide has disappeared. The plates should not be exposed to any light but that of the dark-room until finished, otherwise the parts not rendered insensitive to the action of light are further acted upon and darken to a further extent in the developer, giving rise to fog, or in some cases to dichroic fog.—"Photo Gazette," Feb. 25, 1910, p. 61; "B.J.," May 13, 1910, p. 358.

Development after Fixing.—M. Cremier recommends fixing lantern plates after exposure and afterwards developing them by the physical method. Exposures must be much greater than when developing in the ordinary way. The fixing bath is hypo, 4 ozs.; water, 20 ozs., used for about two minutes; it must not contain sulphite or metabisulphite. After fixation plates are then washed in the ordinary way.

For development a stock solution is prepared as follows :—

A.—Ammonium sulphocyanide	24 gms.	370 grs.
Silver nitrate	4 gms.	62 grs.
Soda sulphite, anhydrous	24 gms.	370 grs.
Hypo	5 gms.	77 grs.
Potass. bromide	½ gm.	8 grs.
Water (distilled) to	100 c.c.s.	3½ ozs.

Dissolve the nitrate of silver by itself in part of the water; dis-

solve the other chemicals in the remainder of the water and add the solution of the mixture to the silver solution. A precipitate forms and quickly redissolves. The solution is finally filtered.

B.—Metol	2 gms.	30 grs.
Soda sulphite, anhydrous	10 gms.	154 grs.
Water, distilled	120 c.c.s.	4 ozs. 2 drs.

The working developer is prepared by adding one part of A to six parts of B.

The greater the degree of exposure the warmer the final tone of the slide. The tone is almost red at the commencement of development, but cools as development proceeds. A large number can be developed together, the transparencies being wiped over with cotton wool and finally washed for fifteen or twenty minutes before drying. —"Photo. Gazette," June 25, p. 141, and July 25, p. 166, 1910; "B.J.," Aug. 5, p. 591, and Sept. 16, p. 705, 1910.

FIXING BATHS.

Reducing Action of Cyanide Fixing Solutions.—Dr. S. E. Sheppard has pointed out that the slight solvent or reducing action of the cyanide fixing bath on negatives is due to the presence (in the cyanide) of cyanate as impurity. The cyanate can be destroyed by addition of sulphite to the fixing solution, and a bath made with this addition does not show the eating-out action.—"B.J.," April 1, 1910, p. 245.

(For some purposes a cyanide bath, with the cyanate thus removed, may be an improvement, but for the chief use to which the cyanide fixing bath is put, namely, for wet-collodion negatives of line subjects, the slight clearing or reducing action of the bath as ordinarily made is a positive advantage, since it gives pluck or brilliancy to the negatives.—Ed., "B.J.A.")

After-treatment of Negatives.

REMOVING STAINS.

Removing Pyro Stain.—According to the "Pharmaceutical Journal" a solution of 50 gms. of sodium sulphate and 23 gms. of calcium chloride in 500 c.c.s. of water is successful in removing pyro stains from the fingers.

Hardening Gelatine.—A. and L. Lumière and Seyewetz, in studying the effect of hardening agents on gelatine, find that formaline is a more active substance than chrome alum, and this latter, in turn, than ordinary potash alum. Quinone comes next to formaline, but has a tendency to stain the gelatine red.—"B.J.," Aug. 12, 1910, p. 604.

INTENSIFICATION.

Mercury Intensification.—Chapman Jones, in two papers before the Royal Photographic Society, reviews the method of intensification in which the negative is bleached in mercuric chloride solution and darkened in one of ferrous oxalate. After twenty years' use he finds

it the only method which is theoretically and practically sound as regards retention of the tone-values in the negative, and also as to permanence. He has proved that proposed substitutes for the ferrous oxalate as a darkening reagent are inferior to it. These include ortol, pyrocatechin, and other developers (either alone or mixed with sulphite), formaline and caustic soda: and stannous chloride dissolved in tartaric acid. He shows by figures how these reagents affect the gradation of the negative instead of raising the scale only.

Mr. Jones directs that the negative be washed for two hours in a washer: in any case giving the second hour's washing in a flat dish, changing the water every ten or fifteen minutes. Hypo-eliminators will not lessen the time necessary for the washing. If the wash-water is very hard, there may be a whitish deposit of calcium oxalate which disappears on varnishing, or may be removed by washing for a few minutes after the oxalate, placing for three or four minutes in 1: 12 hydrochloric acid, and again washing. This is useful for non-curling roll-film, as with the double coating of gelatine there is more need to clear. Reticulation of the whole film of the negative on immersing in the acid mercury bleacher is usually the result of the gelatine; halving the acid in the mercury solution reduces this tendency.—"Phot. Journ.," June, 1910, p. 241; "B.J.," July 1, 1910, p. 496.

Intensification of Dry Plates with Silver.—R. E. Blake-Smith gives improved formulæ for the method of intensification with acid silver (see "B.J.A.," 1910, p. 538). The negative is bleached in a mixture made as follows:—

A.—	Potass. permanganate..............	40 grs.	4·5 gms.
	Water	20 ozs.	1,000 c.c.s.
B.—	Sulphuric acid conct.	200 minims	22 c.c.s.
	Common salt (sodium chloride)	400 grs.	45 gms.
	Water	20 ozs.	1,000 c.c.s.

Mix equal parts of A and B at time of use. First soak negative in water and immerse for six to seven minutes in above. Wash for from five to ten minutes in running water, then place in a solution of sodium sulphite cryst., 60 grs.; sulphuric acid conct., 25 minims; water, 5 ozs., and allow to remain in this solution and exposed to daylight until all brown stain is removed. This may take from half to three-quarters of an hour in bright winter sunlight.

The image now consists of the purplish photo-chloride free from developer stain. The modified method consists in fixing for about ten minutes in plain hypo solution of 1:5 strength, which leaves a faint reddish-orange silver image, very suitable for physical development.

The fixed negative is well washed and then intensified with:—

Metol	12 grs.	1·4 gms.
Citric acid	480 grs.	55 gms.
Silver nitrate....................	36 grs.	4 1 gms.
Water, tap........................	20 ozs.	1,000 c.c.s.

The Wellington intensifier is equally suitable (see Standard formulæ). The intensified negative is then washed in running water for about fifteen minutes, allowed to remain about five minutes in:—

Hypo	5 ozs.	250 gms.
Sodium sulphite cryst.............	180 grs.	20 gms.
Citric acid	40 grs.	4·6 gms.
Water	20 ozs.	1,000 c.c.s.

and finally washed for an hour in running water.—"B.J.," Jan. 21, 1910, p. 43.

Agfa Copper Intensifier.—The following formula is given for this intensifier sold in powder form, the copper sulphate being used in the anhydrous form (see "B.J.A.," 1909, p. 586):—

Potass. ferricyanide	1 part.
Copper sulphate anhydrous	5 parts.
Sodium citrate anhydrous	8 parts.

The intensifier is prepared by dissolving some of this mixture in twenty times its weight of water.

In order to obtain extra pure whites the addition of trisodic phosphate may be made to the formula given above to the amount of ½ part.—Ger. Pat. No. 229,901 of Nov. 26, 1907; "Chem. Zeit." Repertorium, 1910, p. 352.

Bichromate Intensifier.—C. Welborne Piper has found that a plain solution of potass. bichromate, given time enough, will intensify a negative. The method is of theoretical interest only since twelve or more hours' soaking in the bichromate is necessary to get strong intensification, and the plate also requires considerable washing to remove the yellow bichromate stain. If, before drying, a developer be applied, a much darker and stronger image is obtained, whilst if a hypo bath instead of a developer be used, the intensification produced is removed.—"B.J.," Nov. 5, 1909, p. 857.

Control of Contrast.—F. Sforza recommends treating a negative so as to convert the image into one of inactinic, say, yellow, colour, the effect of which is to give prints of extra contrast when the light reaching the negative is complementary in colour to the image. On the other hand, by using a filter of the same colour as the image when printing, the contrasts are reduced, a similar effect being produced by the use of a printing paper sensitised to yellow rays.

The process can be carried out in practice as follows:—The image is converted into lead chromate, for which purpose it is first bleached in the following mixture:—

Lead acetate, 5 per cent. solution, containing 1 per cent. acetic acid	1 part.
Potass. ferricyanide, 5 per cent. solution	1 part.

When thoroughly bleached, the plate is carefully wiped over with a piece of wet cotton-wool, to secure perfect cleanliness of the film,

and is well washed in abundant water; it is afterwards treated with a 3 per cent. solution of nitric acid, again washed, and passed for a few minutes in a 10 per cent. (not more) hypo bath. After a good rinsing in different changes of water, the white lead ferricyanide is converted into yellow lead chromate by an immersion for from two to three minutes in a 5 per cent. solution of potassium bichromate. A careful final washing is indispensable to free the film from any trace of bichromate.

The colour of the filter to be used in conjunction with the plates thus toned must be indigo-blue, which colour is nearest to the complementary of the yellow lead chromate. It would be advisable to manufacture this filter in the shape of stained transparent paper or film, so that one or more thicknesses might be used, as required by each particular case, with a minimum of trouble.

In order to reduce the contrasts a yellow filter must be used, as near as possible in colour to the tint of the yellow chromate image. —" B.J.," July 29, 1910, p. 568. (Compare also " Control of Contrast under P.O.P." in Section V.)

REDUCTION.

Ferricyanide Solution.—A useful means of preserving the ferricyanide solution, employed for Farmer's reducer, is to mix with the ferricyanide, at the time of making up, about twice its weight of ordinary common salt. This keeps the ferricyanide, but appears to have no effect on the action of the reducer.—" B.J.," Jan. 7, 1910, p. 2.

Permanganate Reducer.—A writer, " A.B.," recommends the permanganate reducer made up with alum instead of sulphuric acid, as directed by Namias (" B.J.A.," 1909, p. 587). A suitable formula is:—

Alum, cryst.	50-60 gms.	1 to $1\frac{1}{4}$ ozs.
Potass. permanganate cryst.	2 gms.	10 grs.
Water	1,000 c.c.s.	20 ozs.

A ready method of compounding the above is to prepare a saturated solution of alum as a stock solution, and to dissolve the permanganate in the quantity required at the time of use. The reducer should be kept moving over the negative, and when the reducing action is complete. the latter placed direct in a weak solution of sodium bisulphite or potassium metabisulphite, which will clear away any brown deposit of manganese peroxide—" Photo-Revue," July 19, 1909, p. 21.

Two-Solution Reducer.—Dr. S. E. Sheppard has recommended a two-solution method of reduction as being more under control than those in which the oxidation of the silver image and the removal of the product formed, by a solvent, go on together.—" B.J.," Apr. 1, 1910, p. 246.

R. E. Blake Smith, in supporting this recommendation, says he prefers to use a method published by him in 1909 (" B.J.A.," 1910, p. 539). The principle of the method is to use for the second solu-

tion one which dissolves the unaltered silver, leaving the bleached product. This for the sake of avoiding the harshness usually caused by ordinary reduction. He now advises the following new formulæ for carrying out this method:—

I.	Potassium permanganate	20 grs.	23 gms.
	Water	2 ozs.	1,000 c.c.s.
II.	Sodium chloride (common salt) ..	1½ ozs.	150 gms.
	Sulphuric acid (concentrated)	1 oz.	100 c.c.s.
	Water .... to	10 ozs.	1,000 c.c.s.
III.	Sulphuric acid (concentrated)	1½ ozs.	150 c.c.s.
	Water .... to	10 ozs.	1,000 c.c.s.

The negative to be treated is first well soaked in water. It is then immersed in—I. 10 minims; II., 120 minims; water, 3 ozs. The negative bleaches slowly in this bath, and the progress of the bleaching operation is carefully watched, chiefly by looking at the back of the negative. When the darker parts have been sufficiently bleached the plate is taken out of the solution and washed. After washing is complete the negative is immersed in—I., 40 minims; III., 100 minims; water, 3 ozs. After all the metallic silver has been dissolved out the negative is again washed, and then re-developed with:—

Metol	80 grs.	9·1 gms.
Sodium sulphite (cryst.)..........	240 grs.	27 0 gms.
Sodium carbonate (cryst.)	2 ozs.	100 gms.
Water	20 ozs.	1,000 c.c.s.

The slight yellowish stain which is formed in the permanganate bath (due to an oxide of manganese) will disappear in the re-developer.—"B.J.," Apr. 8, 1910, p. 274.

Quinone Reducer.—A. and L. Lumière and A. Seyewetz have found that certain quinone bodies in acid solution act as reducers, giving effects similar to that of persulphate. The bath found best is:—

Sulphuric acid	20 c.c.s.	3 drams.
Benzo-quinone	5 gms.	45 grs.
Water	1,000 c.c.s.	20 ozs.

This is a solution of clear yellow-colour at first, becoming brown in time, even in the dark, and then depositing a brown precipitate. It does not act on the negative at once. After some minutes (apparently after the solution has penetrated the film completely) the action commences, the denser parts being reduced before the lighter tones. The action is arrested by rinsing in water, and then placing in 20 per cent. soda sulphite solution. This bath also dissolves the silver chloride formed in the film from the presence of chlorides in the wash-water.—"B.J.," Aug. 19, 1910, p. 625.

Local Reduction.—Donald McLeish gives an illustration of the usefulness of reducing part of a negative, the example showing how an unduly heavy foreground may be lightened. He paints over the

thin parts of the negative, on the film side, with indiarubber solution, applying a thick coating with a brush. The negative is then placed in the Farmer's reducer, washed and dried, when the rubber film can be readily rubbed off with the finger-tip, leaving the negative in its original condition.—"Phot.," Aug. 23, 1910, p. 164.

VARNISHING AND RETOUCHING NEGATIVES.

Celluloid Varnish.—E. J. Mills advises the maker of celluloid varnish that the disagreeable smell of amyl acetate is completely neutralised by the addition of a small proportion of common oil of lavender. When the amount is exactly adjusted the mixture smells of neither the one nor the other. No harm is done to the varnish.—"B.J.," Oct. 15, 1909, p. 811.

Mechanical Retouching.—A. V. Davis has designed a flexible holder for the retouching pencil, by which the latter can be rapidly rotated by a small motor, and the work of retouching thus carried out with greater ease and speed.—Eng. Pat. No. 21,586, 1909; "B.J.," June 17, 1910, p. 462.

Printing Titles on Negatives.—J. Gregory gives the following method:—The title is first written or printed on a piece of thin parchment paper, underneath which is laid a piece of carbon paper. On turning the parchment paper over, the carbon paper will have marked it with the title reversed. The carbon paper is then laid on the negative in the position selected, the parchment paper put on the top, with the reversed title upwards, and this is then gone over carefully with the pencil. The carbon paper will then set off the reversed inscription on the negative, which, when printed, will show the title the right way round.—"Phot.," Oct. 19, 1909, p. 315.

Reproducing Negatives.

Reproduced Negatives by Reversal.—J. S. Teape, in a paper before a London society, demonstrated the usefulness of direct reversal by over-exposure for preparing a reproduced negative (reversed as regards right and left) direct by contact printing. Exposures were made to magnesium ribbon, a quarter of an inch burnt at 12 ins. distance giving a good positive transparency. Thirty inches burnt at the same distance gave a good reversed negative, as did also 60 ins. There is a considerable latitude as regards the exposure which will give a good reversed result. The author described experiments in support of the theory that the bromine, liberated on exposure of the silver bromide, by its tanning action on the gelatine prevents the action of the developer upon the parts acted upon by light. If the excessive exposure be given to a plate containing a bromine absorbent (silver nitrate) no sign of reversal is produced.—"B.J.," July 1, 1910, p. 491.

Dr. H. Thibaut has given some modified formulæ for the production of a negative from a negative by the process in which a dry-plate is bathed in bichromate solution, dried, printed by daylight under the

negative, and, after washing out the excess of bichromate, developed in the ordinary way. The modification in the process is to use the following solution in place of the plain bichromate:—

Copper sulphate	1 gm.	90 grs.
Manganese sulphate	3 gms.	260 grs.
Potass. bichromate	6 gms.	530 grs.
Water	100 c.c.s.	20 ozs.

This mixture is filtered and applied to the sensitive dry-plate with a soft brush. The plate is exposed under the negative until the details in the latter are clearly visible at the back; it is washed quickly until the washings run off without colour, and then treated either with metol-hydroquinone or diamidophenol developer, continuing development well through to the back. This variation of the process Dr. Thibaut finds to be more reliable than when bichromate alone is used, and, moreover, not to give rise to crystalline patches on the negative, which would at times occur.—"Photo-Revue," May 22, 1910, p. 161; "B.J.," May 27, 1910, p. 395.

Reversed Negatives by Pinatype.—Dr. E. König refers to the use of the pinatype dye ("platinum black") for preparing reversed negatives direct. The original negative is printed on a pinatype print plate previously sensitised with bichromate. The exposed plate is washed and then coloured with the pinatype platinum black. The image now appears of a brown colour. By treating with the so called fixer (Fixator) the plate becomes black, and equals fully a very finely grained silver image. The dye on the plate is extremely fast to light. This method is recommended as the simplest, cheapest, and surest of making duplicate negatives.—"Process Year Book, 1909-10," p. 73; "B.J. 'Colour Supplement,'" Jan. 7, 1910, p. 3.

For other methods of producing reversed negatives direct, see under "Enlarging"; also "Positives Direct."

Film Photography.

(Negatives on Flexible Supports.)

Failures with Films.—The troubles of many beginners in the use of roll film are probably due very often to overlooking the fact that films are much more slowly acted upon by developers and other chemical baths. Film negatives take longer to develop, to bleach and to re-develop than do those on glass, but, given time, the full action is secured. Regard for this fact will account for the under-development and difficulty in intensification and reduction sometimes complained of by film users.—"B.J.," Oct. 15, 1909, p. 794.

Pinholes on Film-Pack Negatives.—A cause of numerous tiny pinholes produced when using the film-pack in a folding camera is the stirring up of dust by opening and closing the camera whilst the film surface is unprotected. For this reason it is a good plan to insert the shutter of the film-pack adapter before closing up the

camera. A hinged shutter that cannot be drawn completely out would be somewhat of an advantage with film packs. It is less trouble to replace than the loose shutter, while the fact that it is a little in the way of the hands when changing films will induce the habit of replacing it every time.—"B.J.," Oct. 15, 1909, p. 794.

Cellulose (Viscose) Films.—E. Brandenberger has patented the sensitising of cellulose film by dipping the latter into water, and whilst still swollen immersing in a bath of chloride or bromide. The film is penetrated by the salt, which does not form merely a superficial layer, and the film is then sensitised, with or without drying, on a silver bath.—"B.J.," Nov. 12, 1909, p. 879.

V.—PRINTING PROCESSES.

POSITIVES DIRECT.

Imitation Daguerreotypes.—W. W. Weiseisen has recommended the making of a photograph in imitation of the daguerreotype. The process consists in binding an ordinary transparency in contact with a piece of copper, as used by the half-tone plate maker. The copper is burnished, electroplated with silver, and then re-burnished, the effect of the metallic backing being similar to that of the daguerreotype prepared direct on a silver copper plate.—"Bull. Phot.," Jan. 12, 1910, p. 22.

Positives Direct by a Phosphorescence Method.—C. Welborne Piper has described a further method of preparing positives direct which appears to have been worked out, though not published, by the late Douglas Carnegie. It is quite distinct from that described in "B.J.A.," 1910, p. 586, specially for making lantern slides. It is based on the use of a phosphorescent surface (card coated with luminous paint). This is kept in the dark until quite inert, and then exposed to a strong light (*e.g.*, magnesium ribbon) until it glows brilliantly when examined in a dark-room. It is then placed behind a negative, and exposed to *red* light. The red light destroys or reverses the effect of the preliminary exposure, and so the transparent parts of the negative become represented by dark places on the luminous surface, and we have this time a luminous *positive* image instead of a negative. When this is placed in contact with a sensitive film a negative is, of course, produced, and so we obtain the reversed result required.

Mr. Carnegie apparently used a piece of ground ruby glass placed in the printing-frame for making the second exposure. This red glass was inserted first, then the negative, film side up, and finally the excited luminous slab. The result was fairly good as regards exposure, but showed a coarse grain that was not visible at all in any of the results that Mr. Carnegie himself had shown. This coarse grain was evidently due to the use of the wrong luminous slab, probably one of too rough a surface.—"B.J.," Dec. 3, 1909, p. 932.

E. J. Wall gives a review of early literature dealing with photographic effects by phosphorescence.—"B.J.," Dec. 10, 1909, p. 962.

C. Welborne Piper quotes from earlier notes of Carnegie's on the subject.—"B.J.," Dec. 17, 1909, p. 980

Printing Methods and Accessories.

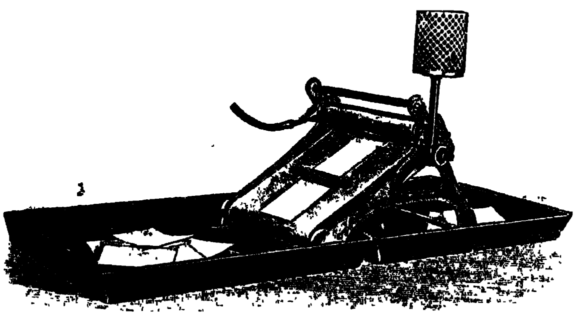
Even Illumination.—In printing from negatives of even patches of density (a graduated test negative) by magnesium ribbon burnt about 8 ft. away, it was found that markings appeared on the print due to reflections from objects near to the printing frame. In the case of ordinary negatives these marks would escape notice, or be put down to slight inequalities in the negative. The best method of avoiding them is to stand the printing frame on the edge of a table or shelf, so that no surface or objects are close to it.—"B.J.," June 17, 1910, p. 450.

Printing Frames, Etc.—Descriptions of all the current apparatus used in printing from photographic negatives in large and small quantity appear in "B.J.," Feb. 11, 1910, in reference to an exhibition held by the "British Journal."

Printing Postcards Wholesale.—See under "Bromide."

Warm Water in Removing Hypo from Prints.—Dr. G. Hauberrisser, as the result of making tests of warm water used for the washing of prints, finds that though the process is shortened the hypo is not reduced beyond the small quantity which is left in the print even after the most thorough washing. This residue of hypo was found to be without effect on the toning of a gaslight print by uranium, though possibly it may affect the permanence of an image on print-out paper.—"Phot. Rund.," Heft. 8, 1910, p. 91; "B.J.," May 13, 1910, p. 362.

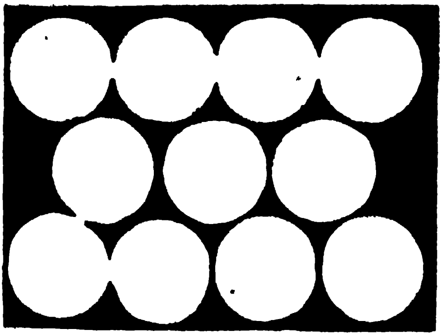
Washing Prints by Pressure.—Working on the lines of MM. Lumière, who have found that hypo is more rapidly removed from



prints if the wash water is pressed out by intermittent squeegeeing, a German worker has devised a machine for the purpose. As shown in the drawing, it consists essentially of a pair of rollers mounted in a framework which stands at an angle of 45° to the working bench. An endless band of rubber cloth enfolds the rollers, and is kept in constant rotation by a small motor. Exerting some slight

pressure on the rubber band at its top position is a second roller, likewise kept in rotation. In use the machine is very simple. It is placed so that it forms a kind of bridge between two dishes; prints from one dish are laid on the travelling band, pass under the top roller by which the wash-water is squeezed out, and then pass into dish No. 2, where they assemble until all have been thus passed through. The whole batch is then retransferred to dish No. 1 (meanwhile filled with clean water) and the process repeated. It is claimed that five soaks with the squeegeeing treatment between each, occupying altogether about twenty minutes, is more efficient than two hours' washing in the ordinary way.—"B.J.," June 17, 1910, p. 450.

Photo-Buttons.—Messrs. Dorritt and Martin, in a letter to the "B.J." on the economies necessary in making the cheap photo-button, give the following diagram showing how the portrait for a



Plan drawing arrangement of 11 buttons in half-plate.

button of the "50-lign size" is obtained eleven times on a half-plate, or forty-two times on a 12 x 10.—"B.J.," Dec. 24, 1909, p 1,002.

Drying Matt Prints.—E. C. Cripps gives the following method for drying prints flat and free from specks:—Obtain from the stationer a piece of "fluffless" white blotting paper eighteen inches in width, and from three to six feet in length. Also get from the draper a yard of "longcloth" calico, which is sold in a width of thirty-six inches. Cut this in half, and the necessary drying arrangement is ready. Lay the length of blotting paper upon a *clean* surface, and over it place the calico. Take the wet prints, and after gently wiping the surface of each, place it face downwards upon the calico, its length at right angles to the length of the piece, When all are down, carefully roll up, and fix the roll with an elastic band. It will thus be seen that the face of the print is on the calico and the back on the blotting paper. When dry, the prints

can be peeled off with ease. If they are required to be dried very quickly, the roll can be placed in front of a fire, when about half-an-hour will be found sufficient.

Two precautions:—Keep the calico free from folds or "kinks," and see that the blotting paper is kept scrupulously clean, and free from particles of dust.—"Photo-Notes," May, 1910, p. 87.

Plain Paper.

Silver Tartrate Sensitiser.—C. A. L. Pearson gives the following formulæ for sensitisers which can be applied to paper, cloth, etc., and the pictures printed out and simply fixed in hypo:—

I.	Silver nitrate	80 grs.
	Tartaric acid	60 grs.
	Ammonia	quant. suff.
	Potass. bichromate solution (10 grs. per oz.)...	4 drops.
	Water	1 oz.

Dissolve the silver in 2 drs. of water, add the tartaric acid, and stir with a glass rod for about half-a-minute. Then add ammonia drop by drop, with constant stirring. A white precipitate of silver tartrate forms, but is dissolved by further addition of ammonia. As solution shows signs of clearing, stop adding ammonia and stir well, adding a final drop or so to clear the mixture. Then add the bichromate solution (if any red precipitate forms which does not dissolve on stirring, add a little more ammonia), and the sensitiser is completed by adding water to make one ounce. It should be clear and of greenish-yellow colour. It will keep well in a stoppered bottle in a cool dark place. For weak negatives the sensitiser may be made stronger (dilute with less water); for contrasty negatives dilute with more water. The sensitised paper keeps for about a week.

The tartaric acid may be replaced wholly, or in part, by citric acid, and the paper then keeps somewhat better. The following formulæ are also good:—

II.	Silver nitrate	80 grs.
	Tartaric acid	40 grs.
	Citric acid (powdered)	15 grs.
	Ammonia	quant. suff.
	Potass. bichromate solution (10 grs. per oz.)...	4 drops.
	Water, to make	1 oz.

The sensitiser is prepared as directed above.

III.	Silver nitrate	80 grs.
	Tartaric acid	40 grs.
	Nitric acid (chemically pure)	30 drops.
	Ammonia	quant. suff.
	Potass. bichromate solution (10 grs. per oz.)...	4 drops.
	Water, to make	1 oz.

One ounce of sensitiser suffices for from eighteen to twenty-four 10 x 8 sheets. Prints are taken a little lighter than they are re-

quired, as they intensify in washing. They are placed direct in a 2 per cent. solution of common salt for a few seconds, then in a strong hypo bath for from ten to fifteen minutes, and finally washed.

Additional bichromate solution up to about twelve drops per ounce of sensitiser gives greater contrast, but beyond this quantity the contrast appears to fall off gradually.—"Cam.," July, 1910, p. 293.

Bromo-Iodide "Solar" Paper.—See "Sensitised Plain Paper for Enlargements" under "Enlarging."

THE ALBUMEN PROCESS.

Stripping Albumen Paper.—See "Albumen Prints for Transference to Glass" under "Prints on Various Supports."

Gelatine and Collodion P.O.P.

GELATINE P.O.P.

Thiocarbamide Toning Bath.—R. E. Blake Smith gives the following formula as the best toning bath, either single or combined, for P.O.P. in respect to freedom from double tones and good colour of the prints. The special points about it are the somewhat high proportion of nitric acid and low proportion of thiocarbamide: also that it should not be used above 40° Fahr.

Three stock solutions are made:—

I.	Gold chloride	15	grs.
	Water	7½	ozs.
II.	Thiocarbamide	24	grs.
	Water	10	ozs.
III.	Concentrated nitric acid	½	oz.
	Water	25	ozs.

The prints should be washed well before toning. They are then immersed in the thiocarbamide-gold bath, made up as follows:—

From 60 minims to 3 ozs. of III. are taken, according to circumstances, and to this are added 60 minims of I. and 60 minims of II. The solution is then made up to 5 ozs. with water. The amount of III. used depends on the brand of paper and the quality of the negative from which the print has been made. It also, to a considerable extent, depends on the tone required. As a first trial, use 2 ozs., and afterwards vary this as experience dictates. The bath should be used at a low temperature, to prevent the softening of the gelatine by the nitric acid; 40 deg. Fahr. should not be exceeded. The use of ice in summer is, therefore, generally necessary. Eight to six quarter-plate prints should be toned together in 5 ozs. of the solution, which is then used up, and should be thrown away. It is never necessary to use the gold at a greater concentration; in fact, it can very well be used at a less one. Thus the maximum amount of gold necessary to tone six quarter-plate prints only works out to cost one-third of a penny. Experience alone will enable one to judge the proper end of the bath's toning action. As in the case of the sulphocyanide bath, the greater the amount of gilding which is allowed to take place, the shorter is the immersion in the hypo bath. After the gilding operation has been carried out, the prints are first rinsed in a dish of water, from ½ minute to two

minutes, according to the amount of acid used in the toning bath, and are then fixed in :—

Hypo	$1\frac{1}{4}$ ozs.
Sodium carbonate (cryst.)	25 grs.
Water	10 ozs.

The water in the dish should not be changed during washing between the thiocarbamide gilding bath and the hypo bath. There must certainly be no washing in running water between these two. This is a very important thing to remember. The reason is, that a certain amount of silver thiocarbamide compounds are formed on the prints. These bodies are unstable except in the presence of acids. One of the decomposition products is silver sulphide, and so we get brown stains on the prints if they are washed for any considerable time between gilding and fixing. The time of immersion in the hypo bath varies with the amount of gilding which has been allowed to take place and with the tone required. As a rule, it is never right to leave the prints in the hypo bath for more than four or five minutes; but no definite time can be given, as, when only a slight gilding has been obtained, a much longer time than this is necessary, in order to get a good tone. It is as well not to let the temperature of the hypo bath get above 50 degs. Fahr.—"B.J.," March 11, 1910, p. 175.

Effect of Alkalies in the Combined Bath.—J. Laing has examined the effect of addition of certain alkaline salts to the combined bath. The bath used was :—

Hypo	4 ozs.	200 gms.
Water	20 ozs.	1,000 c.c.s.
Gold chloride	4 grs.	0·46 gm.

One ounce of this bath was taken, and 10 grs. of one or other of the following salts added to it to observe the effect. Bicarbonate of potash gave light sepia; citrate of potash gave light sepia; acetate of soda gave light sepia; borax gave dark sepia to brown; phosphate of soda gave dark sepia to purple brown. Prolonged immersion in the baths did not alter the tone attained in ten to fifteen minutes, so that any of these baths may be used for obtaining warm tones. Sodium chloride (common salt), after keeping, gave a warm purple tone; potass. nitrate, cool purple; in each case without tendency to yellowness in the whites. With the exception of the bicarbonate bath, all appeared to keep well.—"A.P.," Nov. 23, 1909, p. 504.

Combined Bath.—P. F. Visick gives the following formula for a reliable combined bath giving excellent brownish-purple tones.

Water	10 ozs.
Gold chloride solution (1 gr. per drm.)	2 drs.

Into this dissolve

Lead nitrate	10 grs.

and then

Hypo	4 ozs.

finally adding

French chalk, powdered	$\frac{1}{2}$ oz.
Water	10 ozs.

The French chalk, of course, does not dissolve. The nitrate salt of lead should be used, not the acetate. The above quantity of bath will tone thirty-six quarter-plate pieces of P.O.P. of average subjects. On first placing in the bath, prints become first orange, and pass through shades of brown to a rich purple. In cold weather toning may last a quarter of an hour. After the desired tone is reached the prints are passed through a hypo bath of 3 ozs. per pint, being left therein for a time, so that the total time of immersion in the combined bath and the subsequent hypo bath may be at least ten minutes.

When pouring out a quantity of the bath from stock for use the chalk should be left undisturbed, otherwise it is not so easy to judge the tone of the prints.

A good feature of the bath is that one is warned of its approaching exhaustion by the fact that it will not produce purple tones.—"B.J.," Mar. 18, 1910, p. 197.

Fixing Prints before Toning in the Combined Bath.—MM. Lumière and Seyewetz, as the result of determining the amount of gold actually used in toning prints with the combined bath, have found that the most economical method is that in which the prints are first fixed, as pointed out by Namias ("B.J.A.," 1910, p. 548). In this way 100 c.c.s. of the following bath (containing 0.0264 gm. of gold) tone 30 prints 7 by 5 ins. The number toned without previous fixing is 24. The formula for the bath is that usually given for the Lumière papers, namely :—

Water	1,000 c.c.s.	20 ozs.
Hypo	250 gms.	5 ozs.
Alum	15 gms.	130 grs.
Lead acetate	2 gms.	18 grs.
Gold chloride (1 per cent. solution)	60 c.c.s.	1¼ ozs.

—"B.J.," Dec. 31, 1909, p. 1,009.

In reference to the above results it is pointed out that according to the figures 5 ozs. of the Lumière toning bath, or 10 ozs. of Valenta's bath, should suffice for 125 half-plate prints. But in practice much more gold (4 times the quantity) is used. Also, the tones given by fixing prints before using the combined bath are not usually as good as those produced by placing the prints direct in the combined bath.—"B.J.," Jan. 14, 1910, p. 18.

Controlling Contrast.—F. Sforza advocates fixing P.O.P. prints before toning, and gives several different fixing baths for use according to the greater or less contrast required in the prints. For good average results from normal negatives a suitable fixing bath is:—

Water	1,000 c.c.s.	20 ozs.
Hypo	500 gms.	10 ozs.
S dium chloride	150 gms.	3 ozs.
Sodium bicarbonate	50 gms.	1 oz.

If negatives are somewhat hard, use ammonium chloride in place of the sodium chloride, and in the proportion of 22 parts ammonium chloride per 50 parts of hypo.

For extra hard negatives, print very deeply, and use potassium bromide in place of sodium chloride in the formula.

For still greater reduction of contrast, replace the sodium chloride in the formula by 155 gms. ammonium bromide.

In printing from very flat negatives (increase of contrast) fix in the bath first given, afterwards adding a little potass. ferricyanide to the bath (forming Farmer's reducer), and allow action to continue until the prints reach the required depth.

Prints treated as above are in each case afterwards toned in the combined bath, an excellent formula for which is:—

Water	1,000 c.c.s.	20 ozs.
Hypo	150 gms.	3 ozs.
Ammonium sulphocyanide	10 gms.	90 grs.
Lead acetate	10 gms.	90 grs.
Lead nitrate	10 gms.	90 grs.
Gold chloride (1 per cent. solution)	40 c.c.s.	23 c.c.s.

Add the gold chloride when the other chemicals are all dissolved, and let stand for twenty-four hours before use.—"A.P.," June 21, 1910, p. 607. (See also "Control of Contrast" under "Intensification," Section IV.)

DEVELOPING P.O.P.

Metol and Paramidophenol Developers.—J. Desalme recommends these two developers, and preferably the latter, as the most energetic and controllable for bringing faintly printed P.O.P. to full depth. Metol is best used with citric acid and paramidophenol with tartaric acid.

A solution of metol, 1 gm. per litre, containing also 1 gm. of citric acid, gives tones similar to those of the gold-toned photograph. In both cases the contrasts in the print are about normal, or perhaps a little on the soft side.

The addition of various organic salts affects the tone and also the contrast of the print. Sodium oxalate renders the tone more greenish; sodium tartrate gives browner tones, and acetate of soda tends to purple—that is to say, when it is not employed in presence of free tartaric or oxalic acids.

Paramidophenol tartrate, mixed with acetate of soda and acetic acid, makes one of the best developers for P.O.P. A suitable proportion of the developer proper is from 0·25 to 1 gm. per litre. The stock solution is as follows:—

Paramidophenol (base)	5 gms.	45 grs.
Tartaric acid	7 gms.	60 grs.
Acetate of soda (cryst.)	11 gms.	100 grs.
Acetic acid, 98 per cent.	45 c.c.s.	6½ drams.
Water	1,000 c.c.s.	20 ozs.

This stock bath is diluted with water 5, 10, or 20 times its volume at the time of use; a fresh lot of bath is used for each print, about 50 c.c.s. for one 9 x 12 cm. size. The bath being very cheap, it is better to throw it away after use, since it becomes of violet colour. By adding 0·25 gm. (2 grs. per 20 ozs.) of induline red to

the stock bath, the developer, when diluted, has a bright red colour, and may thus be used for conducting the developing process in quite a bright light.

The use of metol, while leading to quite passable results, is less satisfactory on the whole, since in the fixing bath the half-tones yellow slightly, and the print has a tendency towards double tones, which is not shown by paramidophenol.

In the case of old papers development takes place equally well, but the back of the print is liable to acquire a dark violet stain. This is immediately removed by going over the back of the print with a brush or wad of cotton wool soaked in Farmer's reducer.—"Bull. Soc. Fr. Phot.," June, 1910, p. 207; "B.J.," June 24, 1910, p. 476.

Plain Pyro or Metol.—R. L. Boyd recommends for the development of faintly printed P.O.P. a plain solution of pyro or metol, the P.O.P. itself providing the necessary quantity of acid on the solution being applied to it. For brown prints, pyro solution, ½ grain per ounce, is used. About three drams suffice for a quarter-plate print, the time of development being about five minutes. The print is given a minute or two's wash in water, is fixed for ten minutes in 1 : 10 hypo containing a little ammonia, and is then well washed.

For prints of greenish tone, metol of strength ½ grain per ounce is used; it develops in two to three minutes, fixing, etc., being the same as with pyro.—"B.J.," April 15, 1910, p. 295.

Warm Tones with Gallic Acid.—G. Balagny recommends the following formulæ for obtaining rich warm tones from sepia to warm black:

The prints are made of depth about one-quarter of that which is usually adopted in making print-out pictures. Two stock solutions are prepared.

A.—Gallic acid	10 gms.	2 ozs.
Alcohol, 90 deg.	100 c.c.s.	20 ozs.
B.—Lead acetate	10 gms.	2 ozs.
Water	100 c.c.s.	20 ozs.

To prepare the developing bath, take :—

Gallic acid, solution A	5 c.c.s.	80 minims.
Lead, solution B	1 c.c.	15 minims.
Water	200 c.c.s.	7 ozs.

This formula is an excellent one for prints which have been slightly or half-printed—that is to say, only half the depth which they would be made when toning in the usual way. The developing solution is placed in a dish which is kept for this purpose only; the print, which should not have been previously washed, is slipped in face up, so that it is uniformly covered with the solution. The bath acts slowly; at the end of a minute scarcely any change can be seen in the general tone. The effects produced are of sepia colour, ranging from the clear, true sepia to a sepia brown, according to slight modifications made as below in the composition of the bath.

With the bath given above, and printing to a depth of one-half or one-quarter, sepia tones are obtained.

When treating prints more lightly printed, it is well to use a lesser proportion of gallic acid and develop for longer, thus avoiding the objectionable greenish hue in the tone. The following is a suitable formula :—

Gallic acid, solution A	2 c.c.s.	35 minims.
Lead acetate, solution B	2 to 5 drops	2 to 5 drops.
Water	200 c.c.s.	7 ozs.

If prints somewhat blacker, less warm, in tone are preferred, the following is a good proportion :—

Gallic acid, solution A	5 c.c.s.	80 minims.
Lead acetate, solution B	5 c.c.s.	80 minims.
Water	200 c.c.s.	7 ozs.

This bath, owing to the increased quantity of the lead acetate, gives a pleasing warm black tone.

By adding also a little acetic acid to the bath and increasing the proportion of gallic acid the tones obtained approach those of albumen paper toned with gold. The formula is :—

Gallic acid, solution A	10 c.c.s.	3 drams.
Acetic acid (glacial)	15 to 25 drops	15 to 25 drops
Lead acetate, solution B	5 drops	5 drops
Water	200 c.c.s.	7 ozs.

This is a strong bath. If employed without lead the tone obtained more closely resembles the red chalk obtained with prints exposed to a quarter or half depth. But if the paper is very lightly printed and a few drops of lead acetate solution added, the tone obtained is more like a deep sepia to black.

The best tones are obtained by allowing the exposure to be fairly full and developing in a weak bath. The bath first given may be taken as about the standard for a sepia tone. Addition to it of glacial acetic acid up to about 25 drops will tend towards red chalk, whilst addition of lead acetate solution in small quantities tends towards dark tones.

After development the prints are simply washed to remove acetic acid, fixed in a bath of hypo containing some bisulphite, and finally washed in running water.—"Bull. Soc. Fr. Phot.," June, 1910, p. 200; "B.J.," June 24, 1910, p. 474.

Self-Toning Paper.

Intensifying "Hyptona" Prints.—The Rev. F. C. Lambert finds that in the case of prints on this Ilford self-toning paper, which are a little under strength, the usual saturated solution of mercuric chloride may be applied. It bleaches the print, and the latter is then well washed and re-developed in a weak solution of "Certinal," which gives a slight gain in depth and colour.—"Phot. Scraps," Feb., 1910, p. 109.

Wistona.—Under the name of "Wistona" a printing paper, invented by Mr. B. J. Edwards, has been placed on the market, its method of production apparently being somewhat similar to the "Wisto" paper introduced by the same inventor ("B.J.A.," 1910, p. 555). "Wistona," however, is a print-out paper, which requires fixing only—and that in quite a weak bath of hypo—in order to give purplish prints resembling P.O.P. toned in a bath of gold and sulphocyanide. The paper is considerably more rapid than ordinary P.O.P. On immersion in the hypo for a longer time the prints obtained are of warmer tone—cool-brown to reddish-brown.—"B.J.," June 10, 1910, p. 441.

Phosphate Papers.

Phosphate Emulsion.—W. J. Wilson has patented the addition to a gelatine phosphate emulsion of a soluble phosphate or tungstate, a paper prepared in this way corresponding presumably with the Paget Phosphate paper described in "B.J.A.," 1910, p. 553.

Improved results are obtained owing to the formation of tungstate or molybdate of silver, or to the presence of soluble tungstate or molybdate. A suitable emulsion is :—

A.—Gelatine	60	gms.
Water	600	c.c.s.
B.—Sodium phosphate	17.5	gms.
Citric acid	1.5	gms.
Water	150	c.c.s.
C.—Silver nitrate	25	gms.
Water	150	c.c.s.
D.—Sodium tungstate	7	gms.
Water	75	c.c.s.

Solutions B and C in alternated small portions are poured into solution A. Solution D is finally added slowly. In both cases mixture must be well stirred during the addition. For developing the prints made on paper coated with this emulsion a suitable solution is :—

Metol	7	gms.
Glacial acetic acid	28	gms.
Water	6,000	c.c.s.

The prints thus developed are placed in a bath of sodium thiosulphate containing a little sodium metabisulphite to fix.—Eng. Pat. No. 10,284, 1909; "B.J.," Feb. 18, 1910, p. 122.

Bromide and Gaslight Papers.

BROMIDE PAPERS.

Telling the Right Side of Bromide Paper.—An infallible and very rapid method of telling in the dark-room which is the emulsion side of bromide paper is to stand facing the dark-room safe-light and, taking each end of the sheet between a finger and thumb, to bend

the paper into an arch, when the line of light along the top of the arch will indicate the nature of the surface. The paper side is distinctly more shiny than a matt surface, and has a peculiar unmistakable texture, while the emulsion side will appear perfectly homogeneous. Matt and rough will scarcely show a line of light, but will look dead, while glossy and semi-matt will be at once recognised. Although the description may seem long, in actual practice both sides of a sheet can be examined within two or three seconds, and usually it will be found necessary to look only at one side.—"B.J.," Mar. 18, 1910, p. 189.

Restoring Old Bromide Paper.—A. H. Garner recommends restoring stale or fogged bromide paper by placing for one minute in a weak bath of acid permanganate:—

Potass. permanganate	5 grs.
Sulphuric acid	30 minims.
Water	50 ozs.

It is then rinsed and placed for one minute in a weak bath of sodium sulphite—

Sodium sulphite	20 grs.
Water	1 oz.

After a further rinse it can be exposed wet or may be dried for subsequent use. A simple method of drying is to make a large cardboard box bone-dry and warm in front of the fire, pinning to the bottom and inside of cover sheets of clean blotting paper, which likewise are made quite warm and dry. After removing surface moisture from the treated bromide paper the latter is laid in the box; the blotting paper then re-absorbs from the bromide the moisture which it normally takes up. This plan will suit the amateur worker who has not a proper drying cupboard.

The permanganate and subsequent treatment reduce the speed of the bromide paper to about half.—"A.P.," Oct. 26, 1909, p. 408, and Jan. 11, 1910, p. 30.

Printing Bromide Postcards Wholesale.—G. T. Harris describes simple commercial methods for turning out bromide postcards in numbers from batches of view negatives from each of which, say, twenty to fifty cards are required. The method allows of 1,500 to 2,000 being printed per hour, and is, therefore, equal to the requirements of any but the largest producers. The printing apparatus takes the form of an upright cabinet, square and the height of an ordinary work bench, and a door in front allows of access to the illuminant. The top of this cabinet consists of what is practically a printing frame, with a solid back hinged at one end. The bed of the frame is a piece of good, clear, and thick glass. On this bed rests a similar piece of glass, but of ordinary thickness, which may be removed whenever necessary. This removable piece of glass has a series of eight cells built upon it, with thin strips of hard wood, or vulcanite, each cell taking a 5½ x 3½ negative, a very little extra being allowed each cell in size to permit of the negative being inserted and removed easily. Around each cell, on the top

of the wood divisions, a strip of cardboard is glued, of such thickness that, when the negative is placed in the cell and the postcard filled in, it rests flush against the cardboard fillet, which prevents it slipping off the negative, but yet is not thick enough to hinder the back of the printing frame making uniform pressure when fastened down. When made, the wood and cardboard are coated with japon varnish to prevent particles being worn off and causing dust, etc., in the cells.

As before remarked, the back is solid, and hinged at the right end of the frame, a piece of felt (covering the inside) giving a soft cushion to ensure perfect contact of cards and negatives. At the end opposite the hinges a catch may be affixed to fasten the back, if thought desirable; but, as a rule, it is only necessary to hold the back pressed down with the hand during the time the exposure is being made.

Diffusing Gaslight.

Where electricity is available this undoubtedly constitutes the most convenient illuminant for the interior of the cabinet, otherwise gas leaves little to be desired. A battery of four good Bray burners arranged in a circle about 2 ft. below the negatives gives a very satisfactory illumination. The interposition of a screen of ground glass between the light and the negatives was discarded as being wholly unnecessary, and only needlessly prolonging exposures. The inside of the cabinet should be lined with sheets of zinc or tin, and painted matt white. Exposure is made by means of a tap at the left-hand side of the cabinet, a small pin inserted in the tap preventing its being turned wholly off, so that during changing operations the jets are readily turned down to an inoperative size.

The negatives are invariably reproduced from those taken in the camera, using $6\frac{1}{2}$ x $4\frac{3}{4}$ plates and obtaining them uniform in printing quality. The developer employed throughout was the pyro-soda formula given in the 1909 "Colonial Number" of the "B J." (this formula is given under "Pyro-soda" in the formulæ section of the present "Almanac").

For developing the cards the following diamidophenol developer is used, 20 ozs. being a liberal allowance for a gross of cards :—

Sodium sulphite	1,000 grs.	57 gms.
Potassium metabisulphite	200 grs.	11·4 gms.
Potassium bromide	20 grs.	1·1 gms.
Diamidophenol	100 grs.	5·7 gms.
Water	60 ozs.	1,000 c.c.s.

The number of cards to be developed at a time depends on the particular brand and on the worker's dexterity. With a slow developing bromide, two dozen in the developer is quite practicable; with others, eight or ten cards are enough. Further addition of acid bisulphite solution can be made to the developer so as to reduce the speed of development.

Cards are placed direct in the developer without previous soaking.

are transferred from the developer to clean water, and then into an acid fixing bath composed as follows :—

Sodium thiosulphate (hypo)	8 ozs.	200 gms.
Acid sulphite solution..............	2 ozs.	50 gms.
Chrome alum	40 grs.	2·3 gms.
Water	40 ozs.	1,000 c.c.s.

Two of these baths are used, prints being left in the second for the same time as in the first. For the final washing the method found best is that of transferring from one lot of water to another by hand, with careful draining and squeegeeing.—"B.J.," May 6, p. 341, and May 13, p. 357, 1910.

Rapid Bromide Printing Machines.—The various patterns of these printers on the market early in 1910 are described in "B.J.," Feb. 11, 1910, p. 95, in reference to an exhibition of them held by the "British Journal."

Uniform Exposure and Controlled Development.—J. Sterry has proposed a system of working bromide printing the exact opposite of that usually adopted. The same (and somewhat excessive) exposure is given irrespective of its correctness under the ordinary conditions, satisfactory results being produced by taking prints out of the developer sooner or later according to the rapidity with which they come up.

This system is stated to be workable only with a highly restrained developer containing a good deal of bromide. The best formula for a developer, as regards giving good prints within wide range of exposures and of avoiding the greenish colour which is usually produced under these circumstances, is as follows :—

Hydroquinone	132 grs.	15 gms.
Soda sulphite..........................	6 ozs.	300 gms.
Potass. bromide	88 grs.	10 gms.
Formaline	3 drs.	20 c.c.s.
Water to........	20 ozs.	1,000 c.c.s.

Further bromide may be necessary in the case of excessive exposure.

The rule in exposure is to burn, say, half an inch of magnesium ribbon at nine inches from the negative, adopting some such uniform standard as this for all negatives and bromide papers, and withdrawing the prints from the developer when it has attained the requisite depth.

In the case of gaslight papers an exposure about thirty times the above may be taken.—"Phot.," Sept. 14, p. 212, and Oct. 26, p. 341, 1909.

Local Control by Double Exposure and Development.—R. Thomson describes as most effective the following method of strengthening shadows or subduing lights in the developed bromide print or enlargement. The print is first developed in the ordinary way, rinsed, the water drained off, and the whole print exposed to the full light of a gas burner, say for fifteen seconds at the usual distance—at any rate for a time which, in the ordinary way, would

give a very greatly over-exposed print. The same developer (in orange light) is now used again on a brush, with which it is applied locally to parts of the print which can benefit by being darker. The developer may be thickened with glycerine to prevent spreading and to retard its action, and in this way sky effects may even be introduced into what would otherwise be blank paper. This second development having been finished, the print is fixed and washed in the ordinary way.—"A.P.," Nov. 30, 1909, p. 528.

Amidol and the Acid Fixing Bath.—T. H. Greenall has made experiments to see whether it is true, as stated, that an acid fixing bath should not be used for bromide prints developed with amidol owing to the sulphite in the hypo bath causing fogging or further development during fixation. He finds that nothing is to be feared in this respect when using bromide papers.

With gaslight papers, prints fixed in an old acid-hypo bath, heavily charged with sulphite and amidol, will be stronger than if fixed in plain hypo. But this is due not to increase in density in the acid bath, but to reduction in the plain hypo. Therefore, when using amidol for gaslight prints, it is best to stick to the acid hypo bath unless prints are habitually over-developed, in which case the plain hypo will give somewhat lighter results (though some gaslight papers require the acid bath if stains are to be avoided. Ed. "B.J.A.").—"B.J.," June 10, 1910, p. 432.

Metoquinone Developer.—The following revised formula is given by MM. Lumière in addition to those for negatives which figure under "Negative Processes":—

Water	1,000 c.c.s.	20 ozs.
Metoquinone	3 gms.	27 grs.
Soda sulphite anhydrous	30 gms.	130 grs.
Soda carbonate anhydrous	5 gms.	44 grs.
Potassium bromide, 10 per cent. solution	10 c.c.s.	1½ drs.

During hot weather it is a good plan to use acetone instead of carbonate of soda. In formula No. 1 the 5 gms. of carbonate can be replaced by 10 c.c.s. of acetone.—"B.J.," Dec. 31, 1909, p. 1,008.

Fixing Bath for Bromides.—Harold Smith, writing in reference to an alleged drawback of the acid fixing bath for bromide prints—viz., the risk of exhaustion being unnoticed—considers that an acid bath is necessary, since in commercial work prints cannot be given several washings between development and fixing. In order to test the acid bath as to its continuing to fix efficiently the following two methods are given:—

For plain acid-hypo.—If a test with blue litmus paper does not give the red colour, distinctly and at once, the acid is certainly exhausted, and it is time to make up a new bath. It will be found that the acid is exhausted before the hypo, when the prints are simply rinsed after development as mentioned. This refers to the metol-hydroquinone developer.

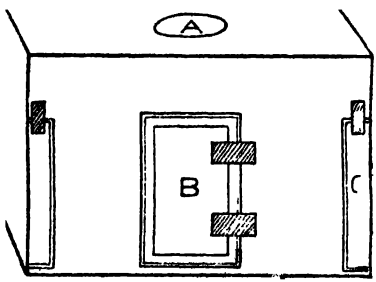
Acid-alum-hypo.—If an acid fixing bath is used for hardening, chrome alum should be the agent employed. The prints should

give that "rubbery" feel to the touch, after a short immersion, less than a minute; and while this is so the bath will not be found to be exhausted. With this bath also there is a change later. The colour of the bath is a very deep blue-green, but clear. On becoming exhausted the bath is muddy, and, if left, a coloured deposit will settle at the bottom, leaving a clear, colourless solution above. Probably, even at this stage, a considerable quantity of hypo remains, but it is obviously more than high time to renew the bath. This stage would be long after the time of the former test mentioned had passed. The bath referred to is the one on page 739 of this "Almanac," which contains a quarter of an ounce or more of chrome alum to the pint.—"B.J.," Oct. 29, 1909, p. 850.

Removing Stains.—M. Morris recommends the mixture of hypo (1 oz.) and alum (300 grs.) dissolved in boiling water (10 ozs.) for use as a clearing solution. The prints should first be given five minutes in a solution of alum 125 grs., water 20 ozs., and the hypo-alum mixture (hot) then poured over the prints and allowed to cool down, during which time the stain will usually disappear. The mixture does not work unless hot, and therefore, the alum treatment is essential. But if too hot the mixture will tone the prints.—"Phot.," Nov. 9, 1909, p. 380.

GASLIGHT PAPERS.

Exposing Gaslight Paper.—E. Fullerton points out the advantage of a printing-box when using gaslight paper. The negative being always at the same distance from the light, the results are more regular, and work can be turned out more rapidly. A simple form of box is shown in the drawing, where A is a hole in the



top, below which the lamp is placed, B a door for removal of the lamp, whilst C is a narrow door with a leather hinge on top for admission of the printing-frame. A similar door is made at the other end of the box. The other side of the box is covered with yellow fabric, giving ample light without danger of fogging prints.—"Photo-Era," June, 1910, p. 254.

Treatment of Stale Gaslight Papers.—R. A. Chrystal has found that gaslight papers, which have been kept so long that they give prints without contrast and of flat and grey appearance, can be brought into proper condition by making them perfectly dry. The impaired qualities are due to damp, which in some cases causes unequal development, the image coming up patchy, that is, at different rates in different parts. Dosing the developer with bromide is without effect, but by placing the paper in a warm dry place for an hour or two even supplies discarded as unsaleable were used with quite satisfactory results, and without special modification of the developer.—"Photo-Notes," Oct., 1909, p. 183; "B.J.," Oct. 22, 1909, p. 822. (See also under "Bromide Papers.")

Metoquinone Developer.—The following revised formula is given by MM. Lumière, in addition to those for negatives which figure under "Negative Processes." The 20 gms. of carbonate can be replaced by 10 c.c.s. of acetone; this modified formula is recommended for use in hot weather.

Water	1,000 c.c s.	20 ozs.
Metoquinone	12 gms.	106 grs.
Soda sulphite anhydrous	40 gms.	¾ oz.
Soda carbonate anhydrous	20 gms.	180 grs.
Potassium bromide solution, 10 per cent	20 c.c.s.	3 drs.

—"B.J.," Dec. 31, 1909, p. 1,008.

Amidol for Gaslight Prints.—As to the difference in the results obtained with amidol according as the fixing bath is of the acid kind or plain hypo, see "Amidol and the Acid Fixing Bath" under "Bromide Papers."

Developers for Sepia Tones.—D. H. Cross gives the following two formulæ for obtaining direct soft and dark sepia tones:—

No. 1.—For soft sepia.

Eikonogen	20 grs.	2·3 gms.
Hypo	20 grs.	2·3 gms.
Hydroquinone	70 grs.	8·0 gms.
Soda sulphite anhydrous	240 grs.	27 gms.
Soda carbonate anhydrous	240 grs.	27 gms.
Ammonium bromide solution (100 grs. in 1 oz. water)	30 drops	50 drops
Water	20 ozs.	1,000 c.c.s.

No. 2.—For contrasty and darker tones.

Ortol	20 grs.	2·3 gms.
Hypo	20 grs.	2·3 gms.
Hydroquinone	100 grs.	11·4 gms.
Soda sulphite anhydrous	240 grs.	27·0 gms.
Soda carbonate anhydrous	240 grs.	27·0 gms.
Ammonium bromide solution (100 grs. in 1 oz. water)	30 drops	50 drops
Water	20 ozs.	1,000 c.c.s.

These two developers can be mixed for intermediate effects.

Prints should be well washed at once to avoid yellowness. If print is found to have a yellow tint it can be treated by first placing in hypo and then transferring to a solution of pure sulphuric acid, 60 drops in 20 ozs water. The hypo bath should contain,—Hypo, 1 lb.; soda sulphite, ½ oz.; in water, 32 ozs.; and prints transferred direct from it into the acid bath.—"Pro. and Am. Phot," Oct., 1909, p. 423.

(It is to be feared that the use of an acid bath thus following hypo will yield impermanent prints.—Ed. "B J.A.")

Sepia Prints by Development.—P. Brennan develops "Carbon Velox" with rodinal containing ammonium carbonate and ammonium bromide in order to obtain warm tones direct.

RESTRAINER STOCK SOLUTION.

Ammonium carbonate	½ oz.	50 gms.
Ammonium bromide	½ oz.	50 gms
Water	10 ozs.	1,000 c.c.s

DEVELOPER

Rodinal	¼ dr.	10 c.c s.
Water	3 ozs.	240 c c s.
Restrainer, stock solution	1 dr	10 c c.s

Develop for much longer than for a black tone. A number of prints may be developed together without fear of overdoing them or staining. Fix in the acid bath as usual.

By sticking to one developer it is easy to obtain a uniform batch of prints. By using more restrainer warmer tones can be obtained, or colder tones with less of the carbonate mixture.—"Phot.," July 5, 1910, p. 6.

Printing-Out "Gravura" Gaslight Paper.—It is pointed out that "Gravura" paper can be placed in the printing frame in diffused daylight in precisely the same way as the ordinary print-out papers. The prints lose very slightly in toning and fixing, so must not be printed too deeply. Printing may be done in direct sunlight for the sake of speed, and each print should be washed for ten minutes in several changes of water before toning.

The following toning bath may be used, toning until no traces of the red image are visible through the backs of the prints by transmitted light :—

Ammonium sulphocyanide (10 per cent. solution) . .	15 minims
Gold chloride (15 grains in 15 drams)	30 minims
Water to make .	7½ ozs.

This quantity is sufficient for twelve quarter-plate or six half-plate prints. After toning, the prints are washed for about ten minutes, fixed for ten minutes in a plain hypo bath of 3 ozs. to the pint, and washed as usual.—"Phot.," Dec. 7, 1909, p. 462.

Colour Sensitising of Gaslight Papers.—Dr. Karl Kieser finds that certain sensitisers increase the speed of gaslight paper towards yellowish light (as much as 50 times), at the same time causing it to print to greater contrast, but also greatly reducing the keeping

properties. Eosine is about the best sensitising dye, and is used as follows :—

Eosine	1 part
Water	10,000 parts
Ammonia	50 parts

Immersing the paper in this solution for $2\frac{1}{2}$ minutes, the increase in speed when tested to the various artificial lights was as follows :—

Arc light	3 times
Daylight	3 times
Incandescent gaslight	25 times
Incandescent electric light	29 times
Flat-flame gas burner	34 times
Oil light	38 times

—"Phot. Korr.," April, 1910, p. 169; "B.J.," July 1, p. 493, and July 8, p. 513, 1910.

Toning Bromide and Gaslight Prints.

Irridescence on Sulphide-Toned Bromides.—Harold Smith has found that the irridescent markings on bromides toned by the sulphide method could be traced, in one instance, to stale sulphide solution—the end of a stock solution which had been kept for several months and had at last become a dirty green colour. The irridescent marks showed chiefly in the dark parts of the prints.—"B.J.," Oct. 29, 1909, p. 850.

Combined Bath after Sulphide Toning.—A. W. Viro, after toning prints by the sulphide method, washes for a minute or two and then tones in the ordinary combined bath, which gives the full range of tones from brown to purple-black. The following is the formula for the combined bath :—Dissolve $\frac{1}{2}$ dram lead nitrate (or acetate) in $\frac{1}{2}$ oz. water, 1 dram alum in 1 oz. water, 1 oz. hypo in 3 oz. water, 1 grain gold chloride in $\frac{1}{2}$ oz. water. Dissolve separately, and add together in order given, when the result should be a clear solution. The above 5 ozs. of solution is sufficient for twenty-five postcards. Prints must not be too deep, and a final wash, of course, is necessary; not more than ten minutes should be allowed with some papers.—"B.J.," May 27, 1910, p. 410.

Thio Toning.—W. F. A. Ermen and Charles W. Gamble have tried the effect of solutions of the sulphides of arsenic, antimony, and tin (in caustic soda) as substitutes for the sulphide solution. They find that when such solutions, suitably diluted, are applied to the bleached pictures, the final images are almost identical in colour with that of the particular sulphide taken. Thus, the arsenic solution gives a bright yellow image, with antimony the colour is crimson, and the tin produces one of brown hue. Either the "*ous*" or the "*ic*" sulphides of arsenic or antimony can be used, but stannous sulphide is insoluble, so that only stannic sulphide is available for the purpose described. The solutions are very unstable, rapidly decomposing with the formation of sodium sulphide. [illegible]

solutions give tones of a much browner hue, similar to those which can be obtained by the use of a freshly prepared solution to which sodium sulphide has been added.—"B.J.," Sept. 9, 1910, p. 681.

Toning by Re-development.—J. Cheshire gives a number of formulæ for bleaching solutions and re-developers to be used on the lines of the process worked out by C. Welborne Piper ("B.J.A.," 1910, p. 562).

A.—Potassium bichromate	90 grs.
Concentrated sulphuric acid	300 minims
Sodium chloride	1 oz.
Water sufficient to produce	10 ozs.
B.—Potassium ferricyanide	140 grs.
Ammonium bromide	180 grs.
Water sufficient to produce	10 ozs.
C.—Copper sulphate	½ oz.
Concentrated sulphuric acid	20 minims
Sodium chloride	½ oz.
Water sufficient to produce	10 ozs.
D.—Mercuric chloride	90 grs.
Hydrochloric acid (pure)	50 minims
Water sufficient to produce	10 ozs.
E.—Potass. permanganate	3 grs.
Concentrated sulphuric acid	2 minims
Sodium chloride	15 grs.
Water sufficient to produce	5 ozs.

After bleaching, the prints should be washed in running water for ten to fifteen minutes, and then re-developed in one of the following solutions, the re-development being done in full daylight; the more actinic the light, the better results will be. The following re-developers will be found to be satisfactory and certain in action:—

I.

Metol	45 grs.
Sulphite of soda	130 grs.
Carbonate of soda	270 grs.
Water sufficient to produce	10 ozs.

II.

A.—Hydroquinone	170 grs.
Potass. metabisulphite	90 grs.
Potassium bromide	20 grs.
Water sufficient to produce	10 ozs.
B.—Ammonium carbonate	1 oz.
Water sufficient to produce	10 ozs.

III.

Edinol	20 grs.
Acetone sulphite	120 grs.
Potass. carbonate	150 grs.
Water sufficient to produce	10 ozs.

Development should be carried on until the tone is correct, and the print then thoroughly washed. No fixing is necessary; and this need not be resorted to unless the tone aimed at is a light one, in which case the tone will be reached before the whole of the silver salt is converted into metallic silver; hence the print must be fixed, or the permanence will be affected. The following table shows the results obtained by the various combinations of bleacher and developer :—

Bleaching Solution used.	Re-developer used.	Result obtained, and Remarks.
A or B	I.	Good black colour, with slight intensification of image
A	II.. (A) 1 part, (B) 1 part	Good sepia tone, quite equal to a sulphided print
A	II.. (A) 2 parts, (B) 1 part, water 1 part	Light brown tone
A	II.: (A) 4 parts, (B) 6 parts, water 1 part	Deep brown, fine colour, white very clear
B	II. (A) 1 part, (B) 1 part	Deep purple-brown colour, quite a pleasing tone, similar to gold-toned P.O.P.
C	II.: (A) 1 part, (B) 1 part	Good black tone
C	I.	Excellent blue black, fine velvety shadows, fine gradation, the colour being as near a carbon black as possible; this on a cream crayon paper gives the effect of an etching
D	I	Jet black, excellent on glossy paper, gives intense detail
E	I.	Warm black tone, etching effect
A or B	III	Warm brown tone. excellent in bromide papers

Ferrous citrate developer also gives excellent brown and sepia tones, varying to red, according to the restraint employed, whilst ferrous oxalate gives perfect blacks. Of course, for obvious reasons, neither of these developers is applicable to a ferricyanide bleached print. The processes work equally well with either gaslight or bromide prints.—"A. P.," May 24, 1910, p. 514.

Bartolozzi Red Tones.—S. H. Carr recommends the following formula, which appears to be based on those of Dr. Sedlaczek ("B.J.A.," 1907, p. 797). The print is toned as far as it will in the following.—

Potass. oxalate ...	240 grs.	27 gms.
Copper sulphate ...	48 grs.	5·5 gms.
Potass. ferricyanide ...	36 grs.	4·1 gms.
Acetic acid ...	12 minims	1·4 c.c.s.
Ammonia alum ...	120 grs.	14 gms.
Water ...	20 ozs.	1,000 c.c.s.

It is then rinsed and placed for five minutes in:—

Copper sulphate ...	30 grs.	68 gms.
Common salt ...	6 grs.	14 gms
Hydrochloric acid ...	3 minims	3·4 c.c.s.
Water ...	1 oz.	1,000 c.c.s.

being finally well washed.—"A.P.," April 10, 1910, p. 344.

Green Tones.—L. Maquenne has given formulæ for producing green tones on bromide and gaslight papers.

The method consists in replacing, to a greater or less extent, the silver of the image by chrome yellow (lead chromate) and Prussian blue. The following stock solutions are required All keep well except Solution C, which will only keep for a month or two:—

A.—Lead acetate cryst. ...	135 gms.	2 ozs. 320 grs.
Iron perchloride solution, 45 deg. Beaumé ...	40 c.c.s.	6 drams.
Acetic acid, glacial ...	100 c.c.s.	2 ozs.
Water to make ...	1,000 c.c.s.	20 ozs.
B.—Lead acetate cryst. ...	100 gms.	2 ozs.
Acetic acid, glacial	100 c.c.s.	2 ozs.
Water to make ...	1,000 c.c.s.	20 ozs.
C.—Potass ferricyanide ...	10 gms.	2 ozs.
Water to make ...	100 c.c.s.	20 ozs.
D.—Iron perchloride solution, 45 deg. Beaumé ...	1 c.c.	18 minims
Acetic acid, glacial ...	5 c.c.s.	90 minims
Water to make ...	500 c.c.s.	20 ozs.

In preparing Solution A the lead acetate is dissolved in about 500 c.c.s. of water, and the iron and acetic acid then added, with constant stirring. Mixture is made up to the 1,000 c.c.s., and, after being left to stand for a day or two in a cool place, is filtered to remove the lead chloride, which during this time deposits itself as crystals.

GREEN-BLUE TONES.

In all cases it is best to give the prints a thorough fixation and washing and to dry them before toning.

The print is placed for two or three minutes in a weak bath of acetic acid:—

Acetic acid, glacial ...	5 c.c.s.	1 oz.
Water ...	40 c.c.s.	8 ozs.

until it becomes limp. It is then placed for six minutes in the

following bath, which will serve to tone in succession five or six quarter-plate prints:—

Solution A	10 c.c.s.	1 oz.
Solution C	10 c.c.s.	1 oz.
Water to make	100 c.c.s.	10 ozs.

This bath should be kept rocking over the print, which in it becomes blue. It is then put to wash for about fifteen minutes in clean water, again placed for two or three minutes in the acetic acid bath, again washed and replaced in the acetic acid, and again well washed. Finally the print is passed through two baths of citric acid:—

Citric acid	5 gms.	45 grs.
Water	1,000 c.c.s.	20 ozs.

and given a final wash of at least one hour. This series of operations is made to remove specially the salts of lead and ferricyanide, and upon this removal depends the final success. The high-lights should be obtained perfectly white, otherwise they will become yellow in the later process. It is well to go over the surface of the print with a clean piece of wool, in order to remove any particles which would lead to spots in the subsequent bath. It is advisable, also, to avoid the use of very hard waters, which precipitate sulphate of lead on the print. The well-washed print is now placed in a weak solution of yellow potass. chromate (not bichromate):—

Potass. chromate	½ to 1 gm.	4 to 9 grs.
Water	1,000 c.c.s.	20 ozs.

Here the tone becomes greenish-blue. The print is washed, passed through the citric acid bath, and again washed. These washings need only to be very brief, and require no special care. The tone thus obtained is a deep greenish-blue; a better colour and a variety of other tones are obtained by the following modification of the process.

Bright Green Tone.

As already described, the print is first rendered limp in the weak acetic acid bath, and then treated in the following mixture for six minutes:—

Solution A	8 c.c.s.	6½ drams.
Solution B	2 c.c.s.	1⅔ drams.
Solution C	10 c.c.s.	1 oz.
Water to make	100 c.c.s.	10 ozs.

It is again washed with great care in the acetic and citric acid baths, and, as before, treated in the chromate and given a brief immersion in the citric acid solution. The tone obtained is sage-green with a bluish tint in the half-tones, which gives a very pleasing aerial perspective to these parts of the subject. By varying the relative proportions of A and B the tone obtained is different. The green is more yellowish in proportion as more of B is used relatively to A. At the same time, a paler print is produced, so that it is necessary to start with a more vigorous result when making a yellowish-green

than when working for a bluish or pure green. If it is desired to produce one single tone throughout the print, instead of obtaining the two-colour effects given by the above process, the following method should be used.

Pure Green Prints.

The print is treated as before in the acetic acid bath until limp, and is then put for a minute and a-half into the following :—

Solution B........................	5 c.c.s.	1 oz.
Solution C........................	5 c.c.s.	1 oz.
Water to make	100 c.c.s.	20 ozs.

being then transferred direct, without washing, for six minutes, to the bath for blue-green first given. It is then well washed, and placed in Solution B, where it undergoes a strong blue toning. This should be pushed a good deal further than if the treatment was to be arrested at this stage. The print is then well washed with the dilute acetic and citric acid baths, and given the green toning in the chromate. The green tone thus obtained is the same in all parts of the print, shadows and high-lights, and its precise colour can be modified by varying the time of treatment in the first lead bath. If, as frequently happens, the gelatine surface loses its original brilliancy, the use of encaüstic paste, or one of the lustre-giving preparations, will restore it, or it can be glazed by the usual method of stripping from glass.—"Bull. Soc. Fr. Phot.," Feb., 1910, p. 67; "B.J.," Mar. 11, 1910, p. 176.

Green Tones on Bromides.—A dry vanadium compound suitable for marketing in tablet or cartridge form is prepared according to a patent of the Chemische Fabrik auf Aktien by adding anhydrous oxalic acid to a syrup of vanadium chloride. A solid mass is formed which keeps well and dissolves in water readily. This compound in conjunction with ferric oxalate, oxalic acid, and potassium ferricyanide forms a solution which gives fine green tones on gaslight and bromide papers. It is stated that 1·35 gm. of oxalic acid is used for 500 gms. of the liquid vanadium chloride, though the strength or specific gravity of this latter solution is not mentioned. On addition of the oxalic acid the mixture becomes a dry mass with evolution of hydrochloric acid gas. A suitable toning mixture is prepared by dissolving 1,000 c.c.s. of water, 3·8 gms. of the dry vanadium compound, 1·5 gms. oxalic acid (anhydrous), 1 gm. ferric oxalate, and 1 gm. potass. ferricyanide.—Ger. Pat. No. 215,071, of Jan. 16,

Green Tones on Gaslight Prints.—An anonymous writer recommends the following for light and dark green tones :—Soak the print until limp in clean water, and then bleach for three minutes in :—

A.—Potassium bichromate	20 grs.
Potassium ferricyanide	100 grs.
Water	8 ozs.

The bichromate will stain the print, and it must be washed until the stain disappears; then tone in a solution made of

B.—Cobalt chloride	80 grs.
Ferrous sulphate	20 grs.
Hydrochloric acid	1¼ drams.
Water	8 ozs.

In this, prints tone in from 10 to 15 minutes.

For lighter greens, bleach for five or seven minutes in A. The longer the print is bleached the lighter the green.

For emerald green use acetic acid 2 drams in place of the hydrochloric acid in B.

After toning, prints are washed for ten minutes, fixed in 1 : 10 hypo, and well washed and dried. The use of artists' fixative is often of advantage in brightening the tone.—"Photo-Era," June, 1910, p. 271.

Two-Colour Effects with Bromide Paper.—H. D'Arcy Power, in further referenece to the production of two-colour bromide prints (see "B.J.A.," 1910, p. 564), has come to the conclusion that the method of most general utility is that in which the print is locally sulphide-toned and then toned as a whole with gold. In the gold bath two actions take place. The untreated parts of the print become of a bluer black; the sulphide-toned parts assume a red tone ("B.J.A.," 1909, p. 609). The print is usually best handled damp, but quite surface-dry. A little bleach made of a solution of potassium ferricyanide 10 per cent. and potassium bromide 5 per cent. is placed in a saucer, and a camel's or sable's hair brush is charged with a very little of it, using it, in fact, almost dry. With this the outlines of the warm tint are carefully traced, the surface bleaching as the brush passes over it. If at any point it is desirable to unite the cold and warm areas by a colour half-tone, the effect can readily be produced by applying the bleach as a fine stipple. Now wash the print for five minutes in running water, and, if at any point you have bleached beyond the line intended, charge your brush with a little developer and locally redevelop to the desired extent; wash, and place the print in the usual 1 per cent. sulphide of soda bath for three minutes; wash until free from odour. The bleached parts are now brown, the rest black silver. The print is next immersed in a bath consisting of gold, 1 gr.; ammonium sulphocyanide, 10 grs.; water, 20 ozs. In this the silver becomes blue-black and the brown sulphide passes through a series of tints to red chalk. The print is to be taken out and washed when the required colour is obtained. If it is desired to carry the change further at one point than at another, the varying degrees are easily obtained by local swabbing with absorbent cotton charged with the gold bath.—"Cam. Craft," Oct., 1909, p. 385; "B.J.," Nov. 12, 1909, p. 872.

The Carbon Process.

Ferment Development of Carbon Prints.—Dr. L. Jacobsohn has patented a method of developing carbon prints depending on the

fact that the exposed and unexposed parts of a bichromated gelatine film exhibit differences in respect to the action of digestive ferments, such as bodies of the pepsin class. The exposed portions are not digested or rendered soluble by the pepsin, whilst the unexposed portions are fully acted upon. The fact is made the basis of a method of development. For example, if a pigment film be sensitised with a 3 per cent. bichromate solution exposed with its non-sensitive side behind a negative, placed in 1 per cent. pepsin solution, containing also 1½ per cent. of hydrochloric acid, the print will become fully developed in three hours at a temperature of 80° Fahr. Owing, it is said, to the longer time of development, finer details are obtained in the half tones, whilst it is further claimed for this method of development that it affords good results in cases of considerable over-exposure of the print.—Ger. Pat. No. 213,772, of July 19, 1908; "B.J.," Oct. 22, 1909, p. 814.

Alcohol Sensitising Bath.—G. Balagny records satisfaction with a spirit sensitiser made as follows:—

Ammonium bichromate	15 gms.	66 grs.
Water	1,200 c.c.s.	12 ozs.
Dissolve and add		
Ammonia	5 c.c.s.	2½ minims.
Stir up bath and add		
Alcohol	300 c.c.s.	3 ozs.

This weak bath (1 per cent.) was used, as negatives were thin. Tissues were sensitised by immersion, and dried in an hour and a half. Development was done in water at 175° Fahr., to nearly boiling without giving rise to any effects of reticulation.—"B.J.," Aug. 12, 1910, p. 607.

The Ozobrome Process.

Ozobromes on Canvas, Wood, etc.—Thos. Manly gives the following directions:—Unprimed canvas is stretched upon a frame and coated with a special priming preparation. After drying, the primed surface is sized with a gelatine solution made as follows:—

Gelatine	1 oz.
Water	20 ozs.
Chrome alum solution, 20 grains to 1 ounce of water	1 oz.

The gelatine is soaked in the water for an hour or two, and then dissolved in a water-bath over a fire. When the solution is quite hot (nearly boiling) the chrome alum solution is added, drop by drop, with constant stirring.

In making the contact between the impressed plaster and the canvas, the surface of the canvas should be floated for about a minute in warm water (about 70° to 80° Fahr.), and the frame placed upon a table, when the plaster can be applied and squeegeed. After squeegeeing the surface, the frame must be turned over and the back of the canvas squeegeed with a roller squeegee. The plaster and canvas should remain in contact for from three-quarters

to one hour, and in developing the backing of the plaster should not be pulled away until it nearly floats off. The frame should not be submerged in the developing water, but the development instead should be carried out by splashing the warm water on to the canvas supported outside the developing tank.

When using wood as a support for the ozobrome a very suitable material is the "Venesta" 3-ply birch, the surface being carefully sand-papered and coated twice with the gelatine solution given above, or the wood can be painted with the canvas priming prepared by the Ozobrome Company, sized, and then treated as though it were transfer paper.—"Phot.," Apr. 5, 1910, p. 299.

Modified Ozobrome.—Dr. L. Th. Van Kleef, as the result of experiment in the ozobrome process, has recommended a modified method of working. The bromide print and carbon tissue are squeegeed together before treatment with the ozobrome solution. A piece of tissue somewhat larger than the bromide print is used and the edges bent in and the corners pressed together so as to form a sort of dish, the bottom of which is formed by the bromide print. In this shape the bromide and carbon tissues together are hung up to dry. Treatment with the ozobrome solution is done by pouring the solution into this "dish," and the author deals with the advantages of applying the constituents of the solution separately, the bichromate first, then, after a short interval, the ferricyanide, and after about double the time the potass. bromide. The advantage of this method is stated to be the ability to allow for differences in the developing powers of the tissues.—"Zeit. für wiss. Phot.," July, 1910, p. 432; "B.J.," Aug. 5, 1910, p. 587.

Gum-bichromate.

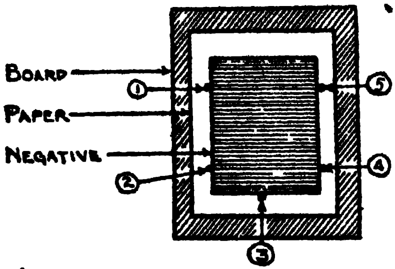
Multi-Colour Prints in Gum.—Mr. R. Witt has given detailed directions for the use of the gum-bichromate process in making multi-colour prints by successive printings (in register) from the one negative, after the manner of the Hofmeister Brothers.—"Journal of the Photographic Society of Philadelphia," No. 3, Vol. XV. (1910); "B.J.," June 10, 1910, p. 435.

Gum-Platinum Printing.—T. L. Anderson gives detailed directions for printing by the gum-bichromate process, using a platinum print of greater or less depth and controlled as considered desirable as the support for the sensitive gum coating (see "B.J.A.," 1910, p. 569). For registration he uses one or other of the following two methods :—

1. Use a printing-frame a size larger than the negative, cut a piece of cardboard the size of the frame, and in the card cut an opening the size of the negative. Place a sheet of plain glass in the frame, lay the card on it, lay the negative in the opening, and place the coated print on the negative. Lift the frame and look through negative and print at a gas-flame, work the print around with the finger-tips till register is secured, then lay the frame down on a table and insert the back with one hand, meanwhile holding the print from slipping with the other. It is easier to see to secure

register if the print is kept next to the light. With very dense or very thin negatives, it is difficult to accomplish registration by this method, and the *second*, or "printing-board" scheme, may be used

2 This is fairly well known, and is also useful at times for single platinum, silver, or bromide printing Secure a flat board, at least 2 ins. larger each way than the negative, and cover one side with felt or other soft material, drawing the covering firmly and tacking the edges down Lay the printing-paper face up on the board and secure with three stout pins, 1, 2, and 3 in sketch



Lay the negative face down on the paper touching pins 1, 2, and 3, and insert pins 4 and 5, touching the negative It will be obvious that if the original platinum print is made thus, register may be secured through any number of successive printings by inserting the pins in the same holes and replacing the negative in the same relative position As a matter of fact, it will be impossible to register the gum printing exactly with the platinum print, since the paper will shrink in drying after the developing and clearing baths, but it is not found that this shrinkage amounts to more than 1-16th inch in an 8 by 10, or an error of 1 32 inch each way in 10 inches, a difference that is allowable in pictorial work — "Amer Phot," April, 1910, p 182

The Oil Process.

Coating Papers for Oil Printing —For those who are unable to fill their requirements among the special oil papers or double transfer papers, as used in carbon printing, there are several ready methods of applying a gelatine coating —One is to place the sheet of paper on a levelled glass plate, first warmed by placing in warm water The paper is squeegeed lightly to the warm glass plate and the warm gelatine solution allowed to flow over it For a sheet 15 ins by 11 ins a normal coating is 2 ozs of solution containing 30 grs flaked gelatine per oz

A quicker method for quantities of paper is to place the gelatine solution in a deep flat dish kept warm in a larger one containing hot water Two sheets of the paper to be coated are placed back to

back, held firmly at one end, and the pair then drawn slowly and steadily through the gelatine solution and hung up to dry. The solution penetrates very slightly between the two sheets so that on cutting away the edges the two are separated when dry, and are obtained perfectly flat and even. This process is not suitable for rough surfaced papers. For these the gelatine mixture must be applied to the paper with a varnish brush of flat pattern and three or four inches across; best one of hog hair, as the stiff bristles penetrate the hollows in the paper. The gelatine solution is kept at a temperature of about 130 deg. F., the workroom itself being kept at about 75 deg. in order to prevent the gelatine setting too quickly. A suitable coating mixture is as follows:—

Nelson's No. 1 gelatine	1 oz.
Water	20 ozs.
Chrome alum (dissolved in 1½ oz. hot water)	12 to 15 grs.
Industrial alcohol	1½ oz.

The gelatine is first soaked in cold water until quite soft, and then liquefied by heat in the usual way. It is then heated up to about 130 deg. F., and the chrome alum solution—at the same temperature—is then added a little at a time, with vigorous stirring. The spirit is then added in the same way. The larger the proportion of chrome alum used, the more insoluble will be the coating. The solution is strained through muslin, and it is then ready for use —"B.J.," Feb. 4, 1910, p. 78.

Bromide Papers for Oil Printing.—P. Pommereuil advises using bromide papers as the basis for the oil print, fixing out the silver emulsion in a hypo bath. He bases this choice on the variety of surface texture thus obtainable among the various commercial bromide and gaslight papers. Among these he specially mentions the Texo-Velox linen grain paper (for effects resembling those on canvas) as well as ordinary Velox and the Lumière B. paper. He sensitises with a 6 per cent. solution of ammonium bichromate mixed with twice its bulk of pure alcohol.—"B.J.," Feb. 25, 1910, p. 134, from the "Bulletin de la Société Havraise."

A Spirit Sensitiser.—Mdlle. S. recommends the following sensitiser:—

Ammonium bichromate 10 per cent. solution	1 part.
Alcohol, 90 deg.	2 parts.

For a sheet 16 ins. by 12 ins. 5 c.c.s. of the bichromate solution mixed with 10 c.c.s. alcohol gives ample sensitiser. A suitable brush is one measuring 3 ins. across and with fairly short hairs (1¼ in.). The sheet is sensitised by successive strokes of the brush, commencing in each case half an inch from the edge, so as not to let the sensitiser reach the under side of the paper. Any streaks which may be visible will disappear by holding the paper vertically from one corner for half a minute and then for the same time from another corner. On placing to dry in a good size box it is ready for printing in half an hour. After exposure it is washed

in water for half an hour, using the first wash water at a temperature of 65 deg. F.—"Revue Société Havraise de Photographie," Feb., 1910, p. 25.

Printing Oil Paper by Gaslight.—H. B. Bradley states the possibility of printing from an average negative by incandescent gaslight. The oil paper used was the Autotype Special No. 2, sensitised with one part of saturated solution ammonium bichromate mixed with two parts methylated spirit. The sensitised paper took ten minutes to dry, was put for half a minute in a moderately warm oven to drive off traces of moisture, and then exposed for one hour at 5 ins. from an ordinary upright pattern incandescent gas light. The paper was found to be fully exposed.—"A.P.," Nov. 9, 1909, p. 458.

A Direct Oil Process.—H. Roch has made experiments on obtaining a surface which can be pigmented by exposing a linseed oil varnish under the negative, the principle of the process being that the drying of such a varnish takes place more quickly on exposure to light. In order to obtain a sensitive surface of sufficient consistency, it is necessary to use linseed oil with considerable addition of resin or calcium resinate (about one part of the latter to two parts of oil), the mixture being thinned with turpentine. Although of theoretical interest, the process is not one of any practical value.—"Phot. Korr.," April, 1910, p. 177; "B.J.," May 13, 1910, p. 359.

The Bromoil Process.

Oil Prints from Bromides.

Bromoil Sensitisers and Methods.—H. W. Rennie, in a paper before the Birmingham Photographic Society, gives the following as the method for working Bromoil found best by him :—

Bleacher :

10 per cent. potass. bromide	3 parts.
10 per cent. potass. ferricyanide	2 parts.
10 per cent. potass. bichromate	4 parts.
10 per cent. hydrochloric acid	3 parts.
10 per cent. alum	8 parts.

This solution is used at 170 deg. F. for two minutes.

Bleach in above, at 170 deg. F.	2 minutes.
Rinse in water at same temperature	1 minute.
Soak in 5 per cent. sulphuric acid at same temp.	6 minutes.
Wash in several changes water	5 minutes.
1.—Fix in hypo	
2.—Or tone with soda sulphide	
3.—Or re-develop with amidol	1 minute.
Wash in water	5 minutes.
Dry thoroughly.	—
	20 minutes.

To Pigment.—Soak fifteen minutes in water at 75 deg. temperature. Pigment in usual way.

The papers found most suitable were Wellington "Carbon Bromide" and "Ordinary Bromide" and Ilford "Carbon" and "Ordinary," in each case developed with amidol, fixed, and washed as usual.

A rapid method when at least half a dozen prints are being done at once is to develop the bromide print, fix and wash as usual, and then insert in the bleacher at 170 deg. F. at intervals of 30 seconds, removing the first print when the sixth has been inserted, and then taking out the others at intervals of 30 seconds. Prints are then rinsed in water at 170 deg., and transferred into 1 : 20 sulphuric acid, also at 170 deg., for six minutes, manipulating them as in bleaching. They are then washed in several changes of water, fixed in hypo for one minute, well washed for five minutes, and then dried.

Instead of fixing out the bleached silver, the image may be redeveloped with amidol or darkened with sodium sulphide, and the full depth print then pigmented as appears necessary in the ordinary way.—"B.J.," Feb. 4, 1910., p. 79.

Relief with Bromoil.—A. H. Hall gives the following method for use when dealing with a bromoil from a poor flat bromide in which it is difficult to get relief :—Pigment up with hard ink. This gives a flat result. Then put the print into the 5 per cent. sulphuric acid for a second time. After the inking up the print is much more susceptible to the acid and easily gives plenty of relief and contrast. —"B.J.," Mar. 11, 1910, p. 186.

Bromoils in Colour.—E. G. H. Lucas has patented a method of preparing pigment prints from bromides as in the Bromoil process, the print, before inking, being soaked in warm water (78 deg. F.) for about 10 minutes, and then, after removal of adhering water, placed level in an oven for about 15 minutes at 75 deg. F. Inking is done by means of special pads, described in the specification.—Eng. Pat. No. 27,957, 1908; "B.J.," Jan. 28, 1910, p. 68.

Reducing Contrasts in Pigmenting Bromoils.—An almost magical effect in the way of remedying a harsh result is the following described by C. F. Gare :—The brush is thoroughly cleaned in the usual way by drawing it over muslin moistened with petrol. When practically, but not absolutely, dry the brush is applied gently to the heavy parts of the subject. This quickly and evenly reduces the strength of the shadows, the action of the brush being maintained by applying it to the petrol rag The result is great improvement in harmony of gradations, and the print dries with a uniform matt surface.—"A.P.," Dec. 14, 1909, p. 593.

Williams' Bromoil Bleacher.—Messrs. Griffin have introduced a bleaching solution for the Bromoil process, worked out by S. H. Williams, of Leigh, Lancashire. The bleacher is an improvement on other formulæ in that it allows of good contrast being obtained from a somewhat inferior bromide, and that it dispenses with the acid bath. The dry bromide print is flooded with the bleaching solution as sold, is washed in water for a few minutes at 70 deg. to 90 deg. F., and then fixed for five minutes or more in :—Hypo

1½ ozs., water 20 ozs. After a brief washing it is ready for pigmenting, or may be dried for use later.

An alternative method is to develop the bromide, wash for a minute or two, and, without fixing, to flood with the bleacher, the subsequent treatment being that given above. This saves one fixing operation.—"B J.," Apr. 1, 1910, p. 252.

Platinum Printing.

A Test of Platinotype Permanence.—A remarkable instance of the permanence of platinotype prints under most critical conditions is afforded by a batch of mounted portraits on AA paper of the Platinotype Co., which remained for twelve months under salt water on the submerged cruiser H.M.S. "Gladiator." Although the soaking totally disintegrated the mounts, the prints themselves (neither the paper nor the image upon it) were not affected in any way.—"B.J.," Dec. 24, 1909, p. 995.

Formulæ for Sepia Platinum Paper.—Imogen Cunningham gives recipes for the preparation of sepia platinum paper based on the formulæ of von Hubl (see under "Platinum Printing," in "Formulæ" section). He uses lead salts in conjunction with mercuric chloride.—"Phot. Rund.," Heft 9, 1910, p. 101.

Iron Printing Processes.

(Other than Platinum.)

Originals for Blue Print Copies.—M. Ullmann has patented the making of an original from which a blue print copy is to be taken in such a way that an impression is formed on both back and front of the original. A convenient method is to lay a sheet of "carbon" paper, as used for manifolding, "carbon" side up underneath when producing the original on the typewriter. The doubly strong impression thus produced allows of direct blue prints being made.—Eng. Pat. No. 21,842, 1909; "B.J.," Feb. 4, 1910, p. 84.

Toning Blue Prints with Sulphide.—E. A. Cunningham has patented the use of a solution of a copper salt in which a ferroprussiate print (after development by the usual washing in water) is treated, copper being deposited in the blue parts of the print. The latter is then again washed and placed in ammonium sulphide solution, which gives a black image of copper sulphide. The copper salt may be incorporated in the sensitising solution.—Eng. Pat. No. 7,578, 1909; "B.J.," Mar. 25, 1910, p. 232.

Grey Tones on Blue Prints.—F. H. Mason obtains a grey to reddish tone as follows:—The print should be made somewhat darker, is washed in the ordinary way (for ten minutes), and then placed in a solution of copper nitrate 5 gms. in water 100 c.c.s., to which a little ammonia is added cautiously, a few drops at a time, until the precipitate first formed is just redissolved, leaving the solution deep blue. This treatment turns the print first mauve, then grey, and finally, after a time, red. Prints dry somewhat

bluer. The process does not do for subjects with great contrasts, since by the time the very dark portions have turned grey the light parts have become red.—"Amer. Phot.," Mar., 1910, p. 172.

Ink Copies of Line Drawings.—H. M. C. has used the following process for securing black line prints direct from tracings, etc.:—A good paper is coated with

Perchloride of iron	120 grs.
Gum arabic solution	½ oz.
Water	12 ozs.
Alcohol	1 dram.

This is applied warm, and when dry the paper is printed for about six minutes in sunlight, giving a copy in which the lines appear as the unaltered yellow of the paper, whilst the ground is white. The print is then gone over with a roller charged with a thin greasy ink, the inked sheet placed in a shallow dish, face up. Inking-up having brought out the lines on a dirty background, the latter is now cleaned up with a wet sponge or soft rag. If the ground is not clear, the print is placed for a few minutes again in the sun, and again sponged. Faintness of the lines is due to over-exposure.—"Bull. Phot.," Mar. 2, 1910, p. 139.

True-to-Scale Process.—R. B. Fishenden, of the Manchester School of Technology, has given working details for this so-called "graph" process. Ordinary ferro-prussiate or blue printing paper is used on which to make the copy from the plan or tracing, but the ferricyanide in the paper is not really necessary, though it does no harm. The paper should be quite fresh and of good quality—a soft paper will sometimes cause trouble in transferring to the gelatine. Exposure should be full; if the print is under-exposed the ground will be dirty in the copies.

A further formula for the gelatine mixture with which the metal plate is coated is given in addition to those named in "B.J.A.," 1910, p. 578:—

Glue or gelatine	40 to 50 parts.
Phenol (carbolic acid)	2 parts.
Glycerine	4 parts.
Water	100 parts.

To this solution is added sufficient of a ferrous salt* (ferrous sulphate may be used) to produce a good printing image when rolling up. The gelatine solution is heated, poured over the plate, and then allowed to set. In this condition the plates may be stored until required, the carbolic acid preventing the gelatine decomposing, and the glycerine keeping the jelly moist during printing by reason of its hygroscopic properties. Should the ferrous salt become oxidised, the gelatine will roll up black, excepting where the exposed portions of the print are placed in contact with it, the ferrous salt being sufficient to remove the insolubilisation caused by the presence of the ferric compound.

*Ferrous ammonium sulphate, which is a more stable compound, may be substituted.

After exposure the print is transferred to the gelatine surface without wetting, and rubbed into contact, and is allowed to remain for at least one minute; if left too long, the surface of the paper will stick to the gelatine, thereby spoiling the work. Lines of the subject should appear slightly sunk in the gelatine.

For inking-up a nap litho roller, or one of gelatine, is used, in conjunction with soft litho ink with plenty of pigment, and "reduced" with a "long" varnish. Inking-up should be brisk with moderate pressure. Any parts not wanted are covered with thin paper, and then the plain paper, on which the copy is to be taken, is laid down and rubbed into contact. About ten copies is the number which can be taken from one gelatine impression by a skilful worker. The jelly is then scraped off the metal and re-melted for use again. In hot weather the addition of a little tannin or chrome alum will avoid softening of the gelatine, but if too much be added prints will not roll-up with a clean background; an alternative remedy is to place the plate over a bath containing a freezing mixture. Those taking up the process for the first time are advised to purchase the gelatine mixture and the ink for use with it before attempting to adjust conditions for themselves.—"Process Year Book, 1909-10," p. 165; "B.J.," Jan. 21, 1910, p. 44.

Kallitype Paper for Black, Brown, and other Tones.—James Thompson gives full formulæ for making and using a home sensitised paper in which sensitive iron salts are used in conjunction with silver nitrate for giving prints which can be developed direct to a black, brown, or green tone, and are readily treated for producing blue, sepia, and red tones. When working direct the time of treating the print, exclusive of washing, is about six minutes.

Suitable raw paper—"Ledger" and "Heavy Bond" stocks. A good brand of the firm-bodied paper which is best is the tough "Scotch Linen Ledger," sold in sheets 19 ins. by 22 ins. of light and heavy weight, and in white and buff, the latter best for sepia effects. Another suitable paper is the "Strathmore" water colour, which is better than "Whatman" in withstanding treatment in the baths and in clearing perfectly in the whites.

Papers must be well sized. A suitable size is made by rubbing up arrowroot in a very little cold water. Warm water is then placed in a clean enamel vessel and the arrowroot paste added, the whole being boiled and strained through linen. The proportion of arrowroot is 3 to 5 grs. for each ounce of water forming the final size.

The size is applied with a kind of Blanchard brush (see below), consisting of heavy flexible white paper folded twice or thrice, and having stretched over it a piece of linen (several folds) or white cotton flannel (swansdown). The loose ends are held with a clip or pinned together, so that the rounded surface is firm and smooth.

The paper to be coated is pinned down on a few thicknesses of newspaper, some of the size poured on it and spread evenly with the pad above described. Sheets are then hung back to back to dry.

If given a second application of size they should be suspended by the opposite corner to dry.

Sensitising is done in two stages:—Salting with the mixture of iron salts and silvering with the silver solution, which provides the material for the image.

The salting solution is made according to the following formula:

Water, distilled	1 oz.
Ammonia iron citrate (green scales)	35 grs.
Ferric oxalate	8 grs.
Oxalic acid	6 grs.
Oxalate of potash, neutral	22 grs.
Nitrate of uranium	20 grs.
Gum arabic	10 grs.
Bichromate of potassium solution A.	3 drops.

To prepare the latter solution, dissolve 10 grs. of bichromate of potassium in 1 oz. of distilled water. Let the salting solution stand for 24 hours after mixing before being used. It is applied with a modified form of Blanchard brush, consisting of a strip of fairly stiff celluloid covered by drawing round it Canton or cotton flannel (swansdown) or white cotton velvet, securing the loose ends with a pin or clip, as shown in Fig. 1.

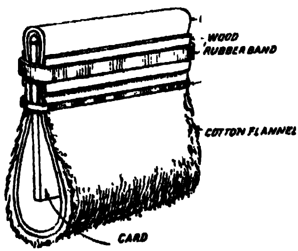


Fig. 1.

In coating the paper is then held in position with the spread fingers and thumb of the left hand, while the "spreader" is wielded by the right. The slight inclination of the board permits the liquid to run downwards when a small pool of it is poured out upon the upper part of the sheet. At this juncture, the brush being brought into action, all portions of the sheet are favoured, each having its allotment. The last movements should consist of long, never hesitating strokes, beginning at the top of the sheet and finishing at the bottom. The idea should be as quickly as possible to wet every portion before any other is dry.

The formula for the silver solution is as follows:—

Water, distilled	1 oz.
Silver nitrate	50 grs.
Citric acid	30 grs.
Tartaric acid	10 grs.

When dissolved, filter or decant.

This is applied in the same way. A useful aid, when coating, is a sheet of heavy glass placed in an inclined position and provided with a glass or varnished wooden clip to hold the paper by means of a rubber band. As shown in Fig. 2, the clip is the full width of the paper and thus holds the sheet firmly. The left hand can thus hold the bottom of the sheet in place whilst the right hand does the coating.

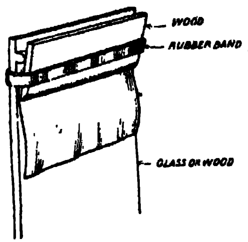


Fig. 2.

Drying must take place at first spontaneously, that is up to the point when all parts of the paper cease to glisten or show signs of wetness. Then the paper can be put in a warm cupboard to dry or can be held at some distance from a fire. But the first surface-drying at ordinary temperature must be observed or the paper will be patchy, one part printing faster than another.

The paper should be printed in the sun to a quite visible image with a tint over the half-tones. As a rule the rougher the paper the less the printing depth which is necessary since the greater quantity of salts in the paper develops a more vigorous image.

For brown tones, soak in water for one minute and fix for three to five minutes in bath :—

Water	6 ozs.
Common salt	12 grs.
Hypo	12 grs.

When fixed, wash for half an hour. Measure the hypo and salt.

For green prints place immediately on removal from the frame in :—

Water	6 ozs.
Potass. ferricyanide	6 grs.
Nitric acid	6 to 12 drops.

The shadows will gradually change from brown to green, though sometimes it is just as well to stop the action while the shadows are still in the region of the browns. The dried print will then have green half-tones and brownish-green shadows—a very artistic effect, in the opinion of some. Experience will be necessary in order to determine just how far to carry the toning action so as to obtain the various results, for prints dry out so much different from

what one would imagine from viewing them in wash water; thus a green may dry blue.

The less nitric acid, the slower the action of toning, and hence the better the control over colour. As a rule, one drop to the ounce is advisable.

When the desired point has been reached, rinse the print, and immerse for some ten seconds in water, 6 ozs.; hypo, 6 grs. (a mustard-spoonful). This is to clear the whites, which otherwise would have a yellow stain. Over-long in hypo may weaken the image, and where a print is of the delicate order, just a dip in hypo will suffice.

A variety of colours, running all the way from russet to a sort of olive, are obtainable, according as we take from the bath at one period or another. Short toning results in the darker tones, longer toning the lighter.

Some of these effects are purely for the pictorialist.

For black prints a different method of preparing the paper is used. Salting is done with the solution already given, and the paper printed under the negative to a faint image. This is then developed in the following solution :—

Water	2 ozs.
Silver nitrate	100 grs.
Citric acid	20 grs.
Oxalic acid	16 grs.

When all is dissolved, filter or decant. This makes a stock solution. To develop, take of it two drams to every ounce of water used.

Print turns black immediately it is immersed. Immerse face down, then turn over and break bubbles. Rinse, then fix for five minutes in water, 6 ozs.; hypo, 10 grs. Wash for half an hour.

If image is not strong enough, make developer stronger. On the other hand, weaken, if prints demand it.

For blue prints the treatment is the same as for green, but the print is kept in the acid bath of ferricyanide until the greater part of the image is blue. Print is then rinsed in water, put through the hypo to clear it, and washed for half an hour. Additional contrast is secured by adding more of the bichromate solution to the salting mixture, say, 5, 10, or 20 drops in place of the 3 given in the formula.

Toning Methods.

For sepia tones an excellent method is the following. It requires a print which is rather over dark as it reduces the depth slightly.

Make up the following solution :—

Hot water	15 ozs.
Bromide of potassium	60 grs.
Bichloride of mercury	60 grs.

When cold it is ready for use, and may be used repeatedly.

Bleach the print in this solution, the image entirely vanishing in the operation. Wash for, say, ten or fifteen minutes, then redevelop in water, 7 ozs.; hypo, 1 oz.

Leave in the latter for five minutes, then wash and dry as usual.

On buff ledger paper the effect is very fine—a dark brown of the nature of sepia as seen in wash drawings.

For red tones the ordinary uranium toning formula may be used. —"Amer. Phot.," Feb., 1910, p. 70; "B.J.," Mar. 4, 1910, p. 157.

Notes by the same author on the use of similar formulæ are given in "Bull. Phot.," Dec. 22, 1909, p. 393.

Miscellaneous Printing Processes and Prints on Various Supports.

Invisible Photographic Images.—W. F. and W. H. Mansell have patented a method of producing the so-called magic or invisible photograph, the subject of which is rendered visible by application of a sheet of paper soaked in (usually) hypo. Instead of sensitising the paper with gelatino-bromide emulsion or an iron-silver sensitiser, as is also used, they first salt the paper with a soluble chloride or bromide, and then apply the design or drawing by a mechanical process, such as a stencil or a line block, using for this purpose an "ink" such as that composed of silver nitrate, 250 gms.; distilled water, 100 c.c.s.; alcohol, 75 c.c.s.; glycerine, 200 c.c.s. This forms an image on the paper in silver chloride or bromide. The paper is then exposed to light and the image, thus rendered visible, bleached in a solution of mercuric chloride, in which state it is sent out. It is then ready for being re-developed in the hypo solution.—Eng. Pat. No. 27,233, 1908; "B.J.," Jan. 7, 1910, p. 9.

Prints in Indigo.—L. Kalb has described a process in which the sensitiveness of a new compound of indigo is employed to make prints for ordinary photographic negatives. The author first prepares de-hydro-indigo bisulphite from de-hydro-indigo and bisulphite solution, and from this compound (which is a well crystallised salt of canary yellow colour and intensely sweet taste), obtains the tetra-brom derivative by addition of bromine followed by neutralisation with sodium bicarbonate. There result needle-shaped crystals of the tetra-brom sodium salt, which after purification dissolve readily in water. The solution of this very sensitive substance is applied to fabrics as a bath or to paper with a brush, and, after drying, exposure made to sunlight behind a negative. The dye is thus formed in the light-affected parts, and an image thus obtained in tetra-brom-indigo. The chlorine compound may also be used in the same way for the fixation of the prints, and a bath of plain water is used to remove the soluble sensitiser, which consists of the bisulphite compound of the dye.—"Berichte," Oct. 23, 1909, p. 3657; "B.J.," Dec. 10, 1909, p. 945.

Reliefs in Bichromated Gelatine.—R. Namias has found that it is practicable to obtain reliefs by exposure of a thick film of bichromated gelatine under a negative by a dry process. The exposed film is heated to a moderate extent, and thus attains a certain amount of relief, somewhat in the way that a surface-dry negative

does, though presumably to a greater extent. The formula for the coating mixture is :—

Gelatine (emulsion or collotype)	30 gms.
Water	100 c.c.s.
Glycerine	5 c.c.s.

About 1 oz. of this is used for a plate 4 x 3 ins. When dry it is sensitised in a 6 per cent. solution of bichromate for 15 minutes, and, after drying, printed under the negative for 10 to 30 minutes in bright light. The best indication of the exposure is the appearance of the bare sensitised metal projecting outside the negative. The edges should become copper-brown in colour.

After printing the plate requires only to be heated, for which purpose it is mounted on a whirler and rotated over a gas or spirit flame. Care should be taken not to employ a degree of heat which will scorch the gelatine. As soon as heating is begun it is seen that the gelatine, in the parts protected from the action of light, greatly contracts. This is noticeable in a less degree in the half-tones, whilst the parts of the print corresponding to the deepest shadows of the negative remain unaltered. The heating is stopped at this point, as further heating will have the effect of reducing instead of increasing the relief.—Eder's "Jahrbuch," 1909, p. 89; "B.J.," Nov. 26, 1909, p. 912.

Printing on Asphaltum.—E. Valenta has worked out a method of preparing asphaltum or bitumen of increased degree of sensitiveness. It consists in digesting Syrian asphalt with sulphur chloride in the heat. The apparatus consists of a glass retort holding about 1½ litres and provided with an ordinary Liebig condenser attached to the retort with cork, not rubber, stopper. The retort is heated on the water bath, being held therein by a porcelain ring enclosing the neck.

In the retort is placed 100 gms. powdered Syrian asphalt. This is dissolved in five to six times the quantity of carbon bisulphide. After complete solution 6 to 8 gms. (4 to 5 c.c.s.) of sulphur chloride is added after previous dilution with 20 c.c.s. of carbon bisulphide. The mixture is added in small doses, shaking after each addition, and the retort having then been connected with the condenser, the water is heated until the contents of the retort begin to boil. Hydrochloric acid and hydrogen sulphide are given off. Distillation is continued until about a third of the carbon bisulphide has passed over. If the distillate is clear and no longer contains hydrochloric acid the process is stopped, the contents of the retort poured into a large bottle and diluted with 2,000 c.c.s. of benzole, after having used the benzole for rinsing out the retort in order to avoid all loss of asphalt. The solution so obtained is filtered and is ready for use. For lithographic work about 2 per cent. of oil of lavender is added to it. The sensitiveness of the coating prepared with it on zinc or copper is fairly comparable with that of bichromated albumen.—"Phot. Korr.," May, 1910, p. 238; "B.J.," May 27, 1910, p. 404.

Rubber Stamps from Photographs.—Marie J. Imbert has patented a method of preparing rubber stamps from photographs. A coating of glue or gelatine (presumably sensitised with bichro-

mate) contains also sodium chloride or a soluble magnesium salt. It is printed under the negative, and the glue which remains soluble washed away. It is then treated with a strong solution of potass. permanganate and the relief hardened with formaline. From this relief, hardened, a mould is made, and from this the rubber printing block.—Eng. Pat. No. 309, 1910; "B.J.," June 10, 1910, p. 440.

Albumen Prints for Transference to Glass, etc.—H. C. Hoyt recommends the following process for preparing prints which may be transferred to glass, opal, etc. Paper is floated for half a minute on a solution of the best india-rubber in benzole and hung up to dry. One corner is first marked so as to indicate the coated side. The coated paper is next floated on an albumenising bath consisting of the whites of fresh eggs with ammonium chloride added (dissolved in the minimum quantity of water) in the proportion of 8 grs. per egg. The mixture is whisked to a stiff froth, let stand for several hours, and then strained into a flat dish for coating the paper.

The sensitising bath consists of silver nitrate, 240 grs.; distilled water, 4 ozs., on which the albumenised paper is floated for one minute and dried.

The paper is printed under the negative as usual, washed, but without toning, squeegeed face down on the surface to receive it, and allowed to dry. The paper support is now removed by going over the back with cotton wool soaked in benzole, which, after a short time, allows of one corner being raised and the whole paper stripped off, leaving the transparent albumen print on the glass. Toning with gold or with mercury and uranium for sepia tones can now be done, after which the print is fixed in hypo about half the usual strength or less. Using polished brass or copper, or aluminium, as the support, some handsome effects can be obtained.—"Bull. Phot.," Mar. 9, 1910, p. 154.

Mounting and Mountants.

The Dry-Mounting Patent.—See under "Business," Sec. 1 of "Epitome."

Dry-Mounting Embossing Folder.—A later patent of G. W. Morgan describes improvements in the metal folder devised for simultaneous mounting and embossing of photographs ("B.J.A.," 1910, p. 582). In order to obviate defective registration of prints on the mount due to expansion of the folder the latter is so made that the plate and die-plate are free to expand, but at the same time preserve their relative positions.—Eng. Pat. No. 7,250, 1909; "B.J.," Mar. 18, 1910, p. 200.

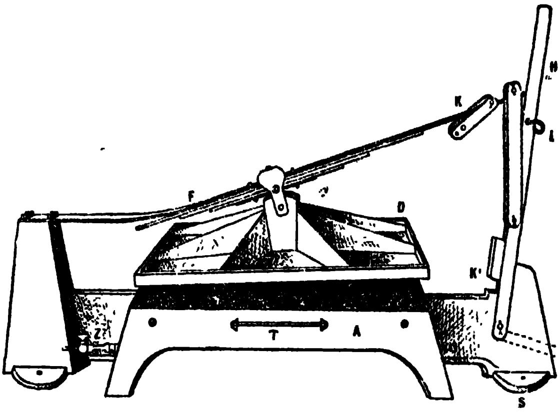
Dry-Mounting with Gelatine.—W. S. Davis coats the backs of the dry prints with a warm solution of soft gelatine. Prints are then put to dry (a few minutes in a warm room), laid in position on the mount, and a light pencil mark made on the latter at the top and left-hand edges of print to serve as a guide. The surface of the mount is then evenly damped with cold water until somewhat

limp. The dry print is then placed in position, covered with a sheet of dry smooth thin paper, and a warm flat-iron applied, going over both print and mount until dry. The heat from the iron turns the water in the mount into steam, which quickly melts the gelatine, causing the print to stick firmly to the mount, and at the same time dries the latter so quickly that both contract evenly.

The gelatine solution is prepared by covering dry table gelatine with warm water and standing the containing vessel in hot water until the gelatine has melted.

Should the print not adhere properly, it shows either lack of sufficient moisture in mount or a failure to cover every part of the print with gelatine. If the mount curls up a little, it can quickly be flattened by slightly dampening the back and ironing. A backward curl would indicate that the mount absorbed too much water.—"Amer. Phot.," June, 1910, p. 338; "B.J.," July 15, 1910, p. 534.

A Dry-Mounting Machine.—H. Hilsdorf has built a dry-mounting press of the form shown in the figure, where A is the iron base. D



the pressure plate, which is operated by pressing down the lever H into the position H[1] even pressure being applied by the flat spring F.—"D. Phot. Zeit.," Apr. 29, 1910, p. 181.

Dextrine Mountants.—The following directions for making a solid mounting paste with dextrine are given by the "Pharmaceutical Journal":—

It is advisable to use the best white dextrine, as inferior qualities are liable to remain sticky on cooling and to be coloured.

Formulæ:—(1) Best white dextrine, 1 lb.; cold water, q.s. to make a stiff paste; water, 10 ozs.; oil of wintergreen, 1 fl. drachm. Mix the dextrine and water together in small quantities of each to get a homogeneous mass; dilute with the 10 ozs. of water, add the oil, and just bring the whole to the boil, when it should be like

clear gum. Pour into pots, cover up, and in twelve to twenty-four hours it will have set to a hard white paste of great adhesive power. (2) Picked white gum arabic, ¼ oz.; dextrine, 2¼ ozs.; solution of ammonia, 4 drops; carbolic acid, 1 drachm; water, 8 ozs. Powder the gum and mix thoroughly with the dextrine; triturate with 2 ozs. of water until a smooth paste is obtained. Add the remainder of the water and boil for ten minutes, and, when cool, add the ammonia and carbolic acid This mountant keeps well for months, is smooth in working, and of great adhesiveness. (3) Dextrine, 25 ozs.; alum, 1 oz.; sugar, 4 ozs.; carbolic acid (10 per cent.), 1½ fl. ozs.; water, 30 fl. ozs

A Liquid Gelatine Mountant.—Gelatine, not previously swollen with water, is dissolved in 15 per cent. solution of barium chloride, forming a syrupy, strongly adhesive liquid. For purposes where the barium salt is not objectionable the adhesive can be used as it is, otherwise sodium sulphate is added, precipitating the barium sulphate as a white deposit and leaving ordinary common salt dissolved in the adhesive liquid.—"Phot. Chron.," Feb. 23, 1910, p. 102.

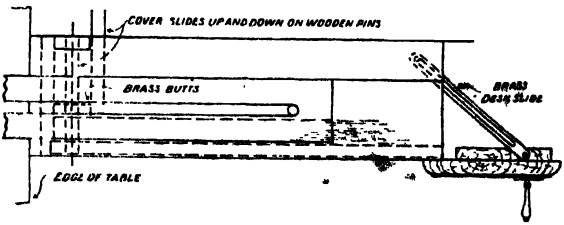
Hanging Framed Pictures Quickly.—When frames have to be put up in numbers, as for exhibitions, the following dodge of the professional picture-hanger will be found to save a great deal of

time and to secure a "straight" position of each print at once. Exhibition frames usually arriving without any plates, rings, or screw-eyes, a supply of the latter of quite small size will serve with all but the heavy frames for attachment to the wall. A pair of

eyes is screwed into the back of each frame without troubling whether they are precisely at the same distance from the top edge at each side or not. The eyes are liberally chalked with the ordinary soft chalk used for blackboards, and the frame being held a little tilted forward from the wall, the worker (standing at arms' length) can judge quite accurately whether the picture is straight. When it is, pressure of the two eyes against the wall will leave two chalk marks, and it is then only necessary to drive a thin French nail at an oblique angle into the wall through each chalk mark to provide a pair of supports ensuring the perfectly straight position of the pictures.—"B.J.," Nov. 12, 1909, p. 871.

Enlarging.

Drawer for the Enlarging Table.—The following description of a drawer, devised by the Eastman Kodak Company for the storage of bromide paper, is quoted from "Studio Light and the Aristo Eagle." The drawer is provided with a heavy board cover, which slides up and down on wooden pins, and serves as a weight to keep the paper flat during storage. This cover is provided with a brass flush ring, so that it may be easily lifted up to a vertical position when it is necessary to remove paper for use.



The front of the drawer pulls down, and is supported by a brass desk slide, making the large sizes of paper stored on the bottom of the drawer easy of access, and permitting the removal of any size sheet without disturbing the remainder. The paper may be stored in this manner in its original enclosures, the size, surface, and grade may be written on the edge of the packet, thus making it

easy to locate and remove any size or grade instantly.—"B.J.," Oct. 29, 1909, p. 839.

Test Plate for Focussing.—A useful method of preparing a line plate for sharp focussing is described by F. W. Langdon, and may be used by those unable to purchase the ruled plates sold for this special purpose. An ordinary negative with the film cleaned off is wrapped round and round from one end to the other with fine black sewing cotton or silk, keeping each turn about an inch from the next. The thread is then wound the other way of the plate so as to form two series of crossing lines. One side of the plate is then flowed over with a clear varnish, or warm solution of gelatine, so as to have the threads embedded in the coating on that side, after which the threads on the other side are cut away. The fine threads allow of sharp focus being secured, after which the thread-plate is removed and the negative substituted.—"Cam. Craft," Mar., 1910, p. 122.

Setting the Enlarger for Work.—C. Welborne Piper, in a paper on the principles of adjusting the light when using different kinds of artificial light in the enlarging lantern, gives the following instructions :—First a negative is put in the carrier and focussed, the light being at the same time roughly adjusted. The negative is then removed, and the light carefully adjusted centrally and at the right distance from the condenser. It is best first to draw it

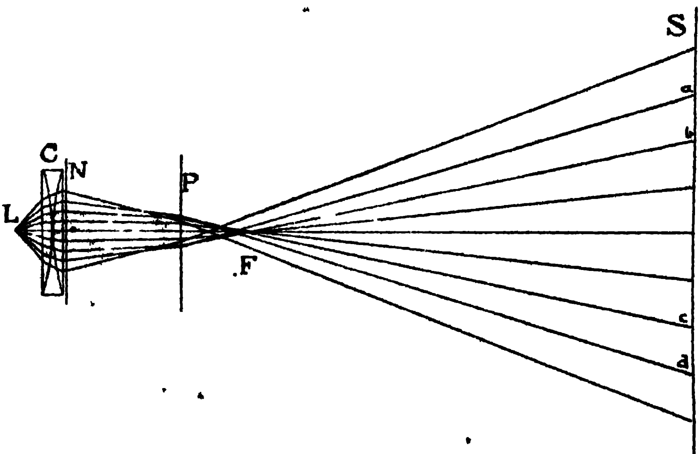


Fig. 1.

well out of adjustment, so as to get all the shadow effects well marked on the screen. It is then centred so that these effects are symmetrical on the screen, and afterwards pushed forward until they disappear altogether. A small light requires very fine and careful adjustment, but gives the best results. With a large light there is

considerable latitude of adjustment, and the disc will be fairly even before the brightest light is obtained. It must be remembered that every time the scale of the enlargement is altered the light is thrown out of adjustment and must be readjusted.

The diagrams illustrate the exact method in which the optical system of a lantern works, both diagrams being actually measured and plotted from a lantern in action. Fig. 1 shows the complete system : The light being at L; the condenser at C; the negative at N; the projecting lens at P; and the screen at S. The system of condenser and projector forms an image of the light source at F, but in Fig. 2, which shows the state of affairs when the projector is removed, it will be seen that the condenser alone gives an image

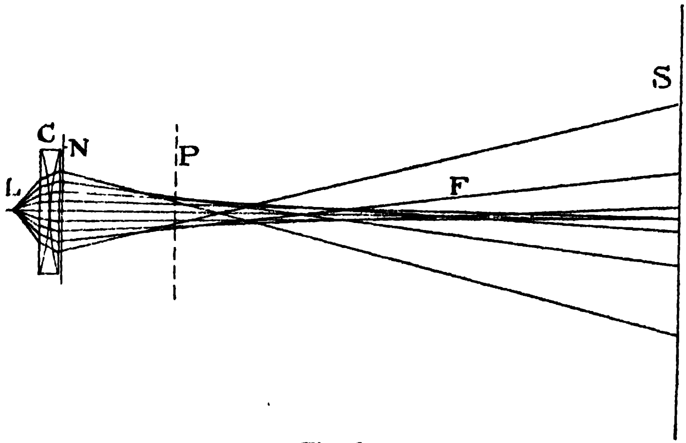


Fig. 2.

at P, much nearer the screen. The uneven distribution of the light on the screen is also shown in this figure, while Fig. 1 shows how the interposition of the projector has converted this non-uniform illumination into a perfectly evenly illuminated disc. Fig. 1 also shows the effect of using too small a projector. Assuming the diameter of the lens at P to be not quite great enough to pass the whole beam of light it is apparent that the rays marked *a*, *b*, *c*, and *d* must be cut out, and so dark shadows will appear within the margins of the disc.—" B.J.," Mar. 18, 1910, p. 195.

Surfacing the Enlarging Easel.—An excellent covering for the surface of the enlarging easel is the soft linoleum or " Cork Lino " sold extensively for floor coverings. It should be glued down all over the board, so that it may lie quite smoothly, and we then have the luxury of a cork-faced easel into which the feeblest pin can be driven with ease, while the hole vanishes when the pin is withdrawn. —" B.J.," Oct. 29, 1909, p. 834.

Pivoted Easel.—A convenient form of enlarging easel has been placed on the market by the Westminster Photographic Exchange. The easel is mounted on a base so that it can be immediately turned over into the horizontal position, thus allowing of the bromide paper being pinned to it without fear of shifting the easel as a whole. The easel-board is then turned back again into the perpendicular position and the exposure made.—"B.J.," Nov. 19, 1909, p. 902.

Support for the Vignetter in Enlarging.—A very useful material for the enlarger who has to work always without any assistance is the lead wire of about ⅛-in. diameter, used by sculptors for lettering and by engineers for making steam joints. Its advantage is that it is quite without spring, and any vignetting mask or shade mounted on it can be instantly set in a given position, and then stays there. Thus, in fixing a vignetter or shading card between the lantern and the enlarging easel one or more pieces of the wire are twisted round some convenient projection. They can carry a letter-clip on the free end for the vignette, or else have some cotton-wool (for the shading) tied on. The "exposing hand" can be used to move the wire, if necessary, during the exposure.—"B.J.," Mar. 28, 1910, p. 190.

Sensitised Plain Paper for Enlargements.—A. J. Jarman has given formulæ for preparing a paper of the so-called "solar" type of sufficient rapidity for enlargements with arc light.

SALTING SOLUTION.

Serum (made from milk)	6 ozs.
Iodide of potassium	1 dr.
Bromide of potassium	30 grs.

The iodide and bromide of potassium are best dissolved by grinding them in the serum in a small mortar, or crushed in an 8-oz. glass graduate with a glass rod (do not use wood or metal of any kind for this operation).

When the salts are dissolved mix with the rest of the serum, and filter through a tuft of absorbent cotton pressed lightly into the neck of a glass funnel, after it has been wet with water and wrung nearly dry. This will prevent clogging during filtration. The pieces of paper may be salted either by floating them upon the liquid for three minutes, and are then suspended to dry, or they may be brushed over the middle of the paper in a circle or square and dried, always placing a lead-pencil mark upon the back, so as to know which is the side to be sensitised when the time arrives to make the picture.

SENSITISING THE PAPER.

Make up the following sensitising solution :—

Distilled water	10 ozs.
Nitrate of silver (c.p.)	300 grs.
Glacial acetic acid	½ oz.

Now take the piece of salted paper and float this upon the sensitiser in a clean glass or porcelain tray for three minutes, or, carefully brush over the surface some of the silver solution with a small tuft

of absorbent cotton, in the case of paper that has been salted in the centre; allow the paper to become only slightly dry, so that there is no liquid to run off the surface, then, having the enlarging apparatus ready, place the sensitive sheet of paper in place of the focussing card. After making the exposure, which may require from a few seconds to a minute or more, remove the paper and develop with the following solution :—

DEVELOPING SOLUTION.

Distilled water	6 ozs.
Citric acid	20 grs.
Pyrogallic acid	12 grs.

The picture will develop in a very short time, when it must be washed in running water in a tray, then fixed in the following bath :—

FIXING SOLUTION.

Water	10 ozs.
Hyposulphite of soda	2 ozs.
Chloride of gold	1 gr.

Place the marked print into this, and allow it to remain for five minutes. It may then be removed and washed well in running water for half an hour, then dried, or pasted up and mounted.

Another developer consists of the following :—

IRON DEVELOPER.

Distilled water	10 ozs.
Glacial acetic acid	½ oz.
Protosulphate of iron	½ oz.
Alcohol (photographic)	½ oz.

This developer will bring out the image rapidly. The development must not be carried too far, or the paper will become grayed; after development wash well and fix as described.

Serum is readily prepared from milk by allowing about a quart of milk to stand until the cream has become well separated, then add 1 oz. by measure of acetic acid to the remaining skimmed milk, stir the acid well into the milk and allow it to stand for twenty-four hours; the curd will separate from the serum, which is the clear liquid that remains. This must be filtered so as to eliminate any trace of fat produced by the cream. A piece of rennet can also be used in place of the acetic acid, the serum in either case will answer the purpose.—"Amer. Phot.," Dec., 1909, p. 736; "B.J.," Dec. 10, 1909, p. 950.

Enlarging in One Direction.—H. Wild has shown the use which can be made of a convex mirror in producing an enlargement in one direction only of the subject, a panoramic effect being obtained. When thus expanding the subject in the horizontal direction, the mirror is placed in the axis of the lens of the enlarging lantern at an angle of about 45°; the printing-frame holding the sensitive paper is placed horizontal, slightly above the mirror. To secure definition it is necessary to stop down the lens of the enlarger to *f*/22 or *f*/32.—"Phot.," Dec. 28, 1909, p. 516.

ENLARGED NEGATIVES.

Making Enlarged Negatives.—R. James Wallace emphasises the importance of using for the transparency from which an enlarged negative is to be made a high-speed, soft-working plate, as used for producing the original negative.

The positive made on such a plate should be developed with a medium soft-working developer, such as rodinal, and, when fixed, should present (if fully exposed) a decidedly flat appearance; as a "transparency" it is not good, being altogether too "flat," with neither "snappy" blacks nor clear high-lights, but it will be observed that every minute shade-tone difference is clearly apparent. It is from a positive such as this that, when dry, the enlarged negative is made.

The plate for the negative should also be of the same quality of emulsion, i.e., the same high-speed plate, and may be developed in rodinal 1 : 20, pyro, or any other medium soft developer, the result being a clean, crisp negative with all of the scale-tone values of the original negative. Obviously either a change in the developing agent (to hydroquinone) or a shortening of the exposure time, with consequent longer development, will result in a negative giving "harder" prints.—"B.J.," Apr. 29, 1910, p. 321.

Enlarged Negatives Direct by Reversal.—G. H. Truman recommends the following reversal process for producing enlarged paper negatives direct from the small negative :—Develop thoroughly, rinse, and apply the reversing solution made as follows :—

Stock Bath.

Potass permanganate	100 grs.
Water	10 ozs.

Reversing solution (mixed at time of use) :—

Stock bath	1 oz.
Water	10 ozs.
Sulphuric acid, pure strong	50 minims.

Discard the working solution as soon as it becomes muddy. Once it has been applied to the enlargement, the rest of the process should be done in white light. Let the reversing bath act for three or four minutes, pour off, rinse the print as it lies in the tray (it should not be handled, as it is tender), and re-apply the developer used in the first instance, holding the tray so that light falls evenly on it. Re-develop for about four minutes or longer, but do not handle the negative until it has darkened completely. It should look considerably denser than what would be correct in a glass negative.

Rinse and fix in the acid bath for about fifteen minutes, finally washing for twenty or thirty minutes in running water. Any stain left on the print is removed by :—

Water	16 ozs.
Sulphite of soda (anhydrous)	1 oz.
Acetic acid	1 oz.

or—

Water	6 ozs.
Bisulphite of soda	1 oz.

Wash for twenty minutes after using either of the above.—"Cam.," May, 1910, p. 194.

G. Balagny recommends a method in which the second exposure to light (for re-development) is made before dissolving away the primary image with the acid permanganate or other solvent bath. The silver image then protects the underlying silver bromide and so prevents fog. The back of the plate is protected during this second exposure, as suggested by D. J. Carnegie for the similar process worked out by him ("B.J.A.," 1910, p. 586). Balagny exposes and develops, washes, re-exposes (protecting the back of the plate with a non-actinic tissue squeegeed on) for one to five minutes in diffused daylight, and then dissolves out the primary image with bichromate or permanganate. The plate, bearing the secondary image (positive in the case of a direct exposure; negative when working from a negative), is thoroughly washed and re-developed in :—

Water	200 c.c.s.
Diamidophenol	1 gm.
Sulphite of soda (anhydrous)	6 gms.
Solution of bisulphite of soda	5 c.c.s.

The bisulphite serves to dissolve the traces of bichromate or permanganate which may remain in the image. The plate will develop slowly, since the acid bath will have diminished its sensitiveness, but in normal development and with a fresh developer a dense image is obtained in ten minutes. It is finally fixed.—"B.J.," Aug. 12, 1910, p. 609.

Negatives Direct from Negatives.—A review of working methods suggested or used for producing positives by reversal on direct exposure in the camera or for preparing one negative direct from another is given by F. C. Lambert in "A.P.," Mar. 15, 1910, p. 280.

See also under "Reproducing Negatives" (Sec. IV.) and "Positives Direct" (Sec. V.)

Lantern Slides.

Lantern Slides Direct by Reversal.—"G. S." recommends the following process as simple, economical, and fairly quick :—Expose as usual, avoiding giving too long a time; a slight under-exposure appears to be best. Develop thoroughly, rinse in several changes, and expose to daylight, the plate being under water in a black developing dish. In the case of a rapid plate, expose for two or three minutes to outdoor diffused light. Return to the dark-room and dissolve off the negative image in :—

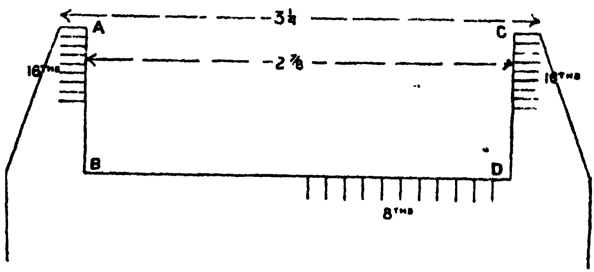
Potassium permanganate	2 gms.	70 grs.
Sulphuric acid	10 c.c.s.	6¼ drams.
Water	1,000 c.c.s.	80 ozs.

Wash carefully and re-develop. For this latter a developer about three times the normal strength should be used, otherwise re-development is a lengthy process.—"Photo-Gazette," Mar. 25, 1910, p. 93; "B.J.," Aug. 5, 1910, p. 590.

Fast Plates for Lantern Slides.—R. James Wallace points out the benefit of using, in the case of *very hard* negatives, a rapid negative plate instead of the ordinary lantern emulsion. The lantern slides are developed as usual and cleared in weak Farmer's reducer, which gives excellent slides of steel-grey colour and great transparency in the shadows. The reducer has not the "eating-out" action on the fine tones which it has in the case of a lantern plate, owing to the fact that the slight veil on the rapid emulsion goes deeper into the film.—"B.J.," Apr. 29, 1910, p. 322. (See also "Making Enlarged Negatives," under "Enlarging.")

Combined Development and Fixing.—V. Cremier recommends combined development and fixing on account of the economy of time when making a number of lantern slides. Exposure should be ample. The developer is given under "Developers and Development."—"Photo-Gazette," Feb. 25, 1910, p. 61; "B.J.," May 13, 1910, p. 358.

Cutting Lantern Masks.—E. G. Underwood recommends a metal template or cutting-shape of the form and dimensions shown in the drawing. The pieces of paper for the masks are first accurately cut 3 3-16ths ins. square by using a metal square template of this size. To cut any aperture desired the square of paper is accurately folded in two and laid under the template with the open part A C exactly level with the fold. On now cutting with a sharp knife round the edges of the template, namely A, B, D, C, an aperture of $2\frac{7}{8}$ x 2 ins. is obtained. Apertures of the same width—$2\frac{7}{8}$—but smaller the other way, are obtained in the same manner, but the template is



pushed further over the fold, so that the latter comes opposite with one or other of the sixteenth marks on either side.

Similarly, if the width of the opening is required to be less than $2\frac{7}{8}$, put the template in position on the folded paper, and place the point of the cutting knife against the first eighth mark from the corner. Then push the template up against the knife, so that the knife is in the corner, note that the alignment at the fold of paper is right, and cut along this end. Now put the knife point back again in its original position at the other end of the cut and draw the template down till the second eighth mark is against it. The

template is now in position to finish, and the other end and back cuts are made. This will give us a mask an eighth of an inch shorter at each end.—"A.P.," Dec. 14, 1909, p. 590.

Green Tones on Lantern Slides.—R. L. Boyd recommends the following method :—

A black-toned slide on the thin side is bleached in bromide and ferricyanide bleacher as usual, and darkened in ammonium sulphide (also called hydrosulphide) and very well washed. It is then put into the blue toner and carefully watched, when in two or three minutes it will become green, the yellow of the sulphide image and the blue together forming green. Almost endless shades can be obtained, according to length in blue toner. It is well to varnish slide with sandarac varnish, as it makes the colours brighter and more transparent.

BLUE TONER.

Iron ammon. citrate	1 gr.
Potass. ferricyanide	2 grs.
Nitric acid	3 minims
Water	2 ozs.

SANDARAC VARNISH.

Gum sandarac	1 oz.
Chloroform	8 ozs.

Apply cold.—"B.J.," Nov. 5, 1909, p. 866.

Generating Oxygen Gas.—Carl Zeiss have patented a mixture for the generation of oxygen which allows of the gas being produced at a lower temperature. Such a mixture is as follows :—

Potassium chlorate	75 to 90 parts by weight.
Peroxide of iron (or manganese dioxide)	10 to 20 parts by weight.
Powdered iron	5 to 10 parts by weight.
Oxalate of iron	½ to 2 parts by weight.

—Eng. Pat. No. 17,809, 1910; "B.J.," October 7, 1910, p. 766.

CINEMATOGRAPH.

Cinematography in Colours.—O. Pfenninger has taken out a patent (No. 5,945, 1909) for apparatus suitable for cinematograph projection in colours on a two- or three-colour system.—"B.J.," Nov. 5, 1909, p. 860.

H. W. H. Palmer has patented the use of a rotating shutter containing light-filters of the three primary screens for use in three-colour work, which shutter is used in conjunction with a plate cinematograph also designed by the inventor; or the light-filters may be made as a separate ribbon film.—Eng. Pat., No. 9,912, 1909; "B.J.," May 27, 1910, p. 407.

(Space will not permit of reference to the numerous patents for cinematograph cameras and projectors. The specifications are published or abstracted in "The British Journal of Photography," and entered in the annual index of that publication under (1) Cinematographs and (2) Name of Patentee.)

VI.—COLOUR PHOTOGRAPHY.

Patents for Colour Photography.—The chronology of the patent specifications relating to colour photography commenced in the monthly "Colour Photography," Supplement to the "British Journal of Photography," is concluded with the issue of December 6, 1907, p. 96.

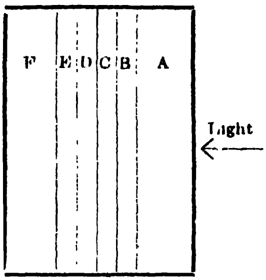
Colour Combination in the Stereoscope.—H. Quentin points out that the methods put forward for obtaining two-colour effects by combining two different monochrome impressions the stereoscope are capable of producing "interesting" results. He reviews the systems which have been proposed of late.—"Phot. Couleurs," Nov., 1909, p. 221; "B.J.," "Colour Supplement," March 4, 1910, p. 20, where it is pointed out that with such additive processes the colours change and alternate in the irregular manner described by Wheatstone.

Three-colour Processes.

THREE-COLOUR PRINTS AND TRANSPARENCIES.

Multiple Plate for Colour Photography.—F. E. Ives has patented a combination of emulsion films requisite for exposure by the three-colour method, the emulsion being so arranged that all three receive the action of the light at a single exposure. The arrangements are as follows:—A glass plate is coated with a very fine grain transparent emulsion, such as that used in the Lippmann process, and sensitive chiefly to the blue-violet and ultra-violet rays. The film side of this is given a very weak coating of a yellow dye in order to cut out any blue-violet rays which might pass through the film. The plate bearing this blue-sensitive emulsion is placed with the glass side outwards (towards the lens). Behind it is placed a thin film of celluloid or collodion coated with a green-sensitive emulsion and placed emulsion side away from the sensitive film on the glass plate. Behind this green-sensitive film is a second glass plate coated with a red-sensitive emulsion, which latter is placed film to film with the green-sensitive emulsion. This plate No. 2 is given a coating of a red or orange dye, which, in conjunction with the blue-sensitive and green-sensitive emulsion films, allows the red or orange rays only to reach the emulsion on the back plate. The

three sensitive surfaces are bound together, and it will be seen that all three are practically in one plane; they are actually so saving only for the film between the two plates, and this film can be made extremely thin. After exposure the binding is removed and the two plates and the film developed together.—Eng. Pat., No. 7,932, 1908; "B.J.," Jan. 14, 1910, p. 29.



A. Glass plate.
B. Blue-sensitive emulsion.
C Film.
D. Green-sensitive emulsion
E. Red-sensitive emulsion.
F. Glass plate.

F. E. Ives has put this multiple film (in a form modified as described below) upon the market under the name of "Tripak," and has designed, for use with it, a camera of the construction shown in the figure. The outfit is made by the Ives Inventions, Limited, 939, Eighth Avenue, New York.

The plate-pack is taken out of the box of plate-packs like a single plate, laid in the plate holder, and the back closed. When it is put in the camera and the slide drawn out, the first plate in

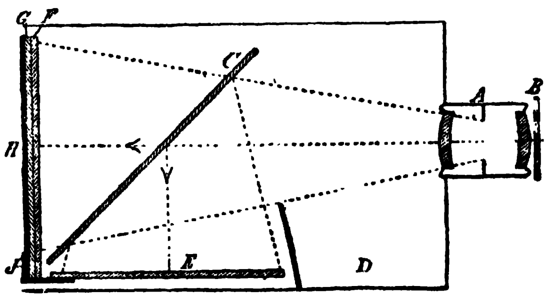


Fig. 1.

the pack, blue-sensitive, falls forward in the camera to a position at right angles to the others (Fig. 1) and then, by a lever, a 45 deg. yellow glass reflector is brought into position to reflect an image from its first surface downward upon this plate. The green and

red rays pass through the reflector to the green and red sensitive plates, which are pressed together face to face, making a reversed green record and an unreversed red record. After exposure, the B plate is turned back in the holder before inserting the slide, and afterwards in the dark-room the pack is still handled as a unit, being placed in a developing rack in which it opens like a book, is locked open, and then the rack inserted in a tank for development. The operations are in every way as simple as photography with the spool film, except that time exposures must always be given. With the plates and developer in use, the rule for exposures is exactly the same as for Autochrome plates. Greater speed may be attained with other plates, or with the same plates with less perfect colour selection, or with other developers; but much depends upon quality of negatives.

For printing transparencies (for projection in an ordinary lantern) from these negatives Mr. Ives has worked out a sensitive film composed of amyl-acetate collodion, the sensitive coating being bichromated fish-glue. It develops in cold running water in ten seconds when the film is fresh, makes a relief so low that it is almost invisible when dry, and if first treated with dilute chromic acid dyes in from two to five minutes and then dries after blotting off in two or three minutes. Of course, in order that the prints may all dye to the right depth in the same number of minutes, suitable dyes have to be used and the strength of the dye baths standardised, and so with everything that is used.

The dyes are mordanted by chromic oxide and discharged by alkalies, and for this reason, combined with the remarkable tenuity of the glue relief, local treatment can be given with extraordinary facility. Any colour which is in excess may be discharged gradually, without destroying the photographic gradation, by means of a brush containing water to which ammonia has been added in the proportion of one drop to a pint of water, and the reduction can be stopped instantly by applying a blotter. Hues are changed and brightened by discharging one of the colours—thus, a blue can be given a brighter and more peacock hue by discharging some of the colour in the magenta print, or made a more violet shade by discharging some colour in the peacock print, or made purer and more brilliant without alteration of hue by discharging any colour which may be present on that part of the yellow print.—"Journ. Soc. Chem. Indus.," May 16, 1910, p. 542; "B.J." (Colour Supplement), July 1, 1910, p. 49.

Tissue for Three-Colour Carbon Prints.—Edgar Clifton and A. E. Wells have patented the addition (to the coating mixture for the blue carbon tissue employed for three-colour prints) of an opaque pigment or dye which can afterwards be removed from the tissue, leaving the blue pigment. This method is employed to prevent "printing through" of the tissue. A suitable addition is manganese peroxide, which obstructs the light, but is immediately removed on placing the tissue after development in a solution of sulphurous acid.—Eng. Pat. No. 23,273, 1908; "B.J.," Mar. 4, 1910, p. 163.

Three-Colour Prints.—J. Sury and E. Bastyns, in preparing three-colour prints by a combination of the ferro-prussiate and gum processes (see "B.J.A.," 1907, p. 643), apply a coating of gum solution to the back of the paper before sensitising with the ferro-prussiate mixture. When this gum coating has dried the solution of ferric citrate and potass. ferricyanide is applied, the image being developed in water in the usual way, when the gum coating dissolves out.—Eng. Pat. No. 27,687, 1908; "B.J.," Jan. 21, 1910, p. 48.

Trichrome Prints by Ferricyanide Method.—A. Le Mée gives working details of a process of three-colour printing by superimposition, in which the blue image is formed by ferro-prussiate, the yellow by the action of light on ferricyanide, and the red by a hydrotype method. Compare Leiber ("B.J.A.," 1909, p. 662), who published a somewhat similar process.—"Photo-Revue," May 1, 1910, p. 139; "B.J.," Colour Supplement, June 3, 1910, p. 41.

Three-Colour Prints by Modified Diachrome Process.—R. Namias has suggested improvements in the process (based on that of Traube) described in "B.J.A.," 1910, p. 595. He now bleaches the positive print (on opal) in a mixture of equal parts 10 per cent. potass. ferricyanide solution and 5 per cent. lead acetate solution, the latter containing 1 per cent. of acetic acid. Bleaching takes about 10 minutes, after which the plate is put through 1 per cent. nitric acid for about 10 minutes, rinsed and dyed. The dye solution is made up with ½ to 1 gm. of dye per 1,000 c.c.s. of water, adding about 10 gms. sodium acetate. The plate is left until fully dyed, and then washed until clear in the lights.

If it is wished to remove the silver ferrocyanide from the image (it darkens in time), a suitable bath is:—

Hypo	100 gms.	2 ozs.
Sodium acetate cryst.	50 gms.	1 oz.
Water	1,000 c.c.s.	20 ozs.
Acetic acid, glacial	5 c.c.s.	44 grs.

The glass or opal plate is washed for about half an hour, and then placed in 5 per cent. alum solution, containing ½ per cent. copper sulphate, which improves the permanency of the colours. The process may be used for making transparencies on glass or prints on an opal support (but is still in the experimental stage—Ed. "B.J.A.").—"Phot. Couleurs," Oct., 1909, p. 195; "B.J.," Colour Supplement, Dec. 3, 1909, p. 91.

Tauleigne-Mazo Transparencies.—H. Quentin has given details of the process worked out by M. Tauleigne on the lines of that of the Traube "Diachrome," though independently of Dr. Traube. As in the "Diachrome" process ("B.J.A.," 1910, p. 595), a developed silver image is treated with a bleaching agent which converts it into a compound capable of fixing a dye, the mordanting body being afterwards removable by a fixing bath. The Tauleigne bleacher is:—

Copper chloride	10 gms.
Acetic acid	a few drops.
Water	90 c.c.s.

The action of this bath is very rapid; the image bleaches first in the half-tones, then in the shadows, and is finally converted into a buff-coloured image of silver chloride. It is then washed for 15 to 20 minutes and placed in the following iodising bath :—

Potass. iodide	2 gms.
Water	100 c.c.s.

Here the image becomes pale yellow (iodide of silver). Viewed by transmitted light, it is seen to be of considerable density, and of orange colour. The second part of the above process is complete when the film, viewed from the back, has acquired in the deepest shadows this same yellow colour of silver iodide. When this is the case, the film is plunged into water, is washed for a few minutes, and is then ready to be dyed up.

The following stock solutions are prepared :—

RED BATH.

Fuchsine	1 gm.
Boiling water	1,000 c.c.s.

BLUE BATH.

Methylene blue	1 gm.
Cold water	1,000 c.c.s.

YELLOW BATH.

Auramine	5 gms.
Water	1,000 c.c.s.

In order to prepare the normal dye bath 10 c.c.s. of the specific stock solution are added to 200 c.c.s. of water, together with a few drops of acetic acid.

The dyeing process lasts about twelve hours, at the end of which time the prints should not show any trace of the silver iodide on the back. If dyeing takes more than twelve hours, it is well to increase the strength of the bath by the addition of a little more stock solution. On removal from the bath the high-lights of the film are slightly coloured, but are cleared by washing in running water.

The transparencies are then best treated by placing first in 5 per cent. tannin solution for about 10 minutes, next in water to wash out excess of tannin, and then for from 15 to 20 minutes in strong hypo solution. The film transparencies are mounted in register upon each other on a rigid support.—"Phot. Couleurs," June, 1910, p. 130; "B.J.," Colour Supplement, July 1, 1910, p. 51.

One-plate three-colour Processes.

PROCESSES OF PREPARING SCREEN-PLATES.

Under this heading are described processes, the products of which at the time of writing (Sept., 1910) are not on the market.—ED. "B.J.A."

Screen Plates.—In a lengthy paper before the Royal Photographic Society on "Some Experimental Methods Employed in the Examination of Screen-plates," C. E. K. Mees and J. H. Pledge first review the methods of preparing colour screen-plates, such as those employing ruled lines, dusting-on, printing in bichromated colloids,

section cutting, mechanical printing, or a combination of mechanical methods and dyeing. They review the methods employed in the following processes :—Joly, McDonough-Joly, Autochrome, Palmer, Aurora, Bamber, Warner-Powrie, Dr. Smith, Thames, Wratten, Dufay, Cajal, Krayn, Masser and Hudson, Omnicolore, Berthon and Gambs, Szczepanik, Szczepanik-Hollborn.

By the "first black condition" is meant that the screen itself should be free from colour, that is of neutral shade—this, in order that whites may be rendered pure. A plate should always be adjusted to fulfil this condition by alteration of the *area* of the units, not by adjustment of the depth of colour, which must be strictly defined by the depth necessary to obtain the requisite filter-cut. Among commercial screen-plates the Autochrome and Omnicolore are slightly pink and the Dufay greenish.

As regards the total absorption of light by the screen-plate, this is mainly conditioned by the green constituents of the filter coating. Under the best conditions for the other filters, green might occupy half the area of the plate. Also in order to fulfil the first black condition the green area must transmit about two-thirds of all the light transmitted by the plate. Consequently, half the plate will transmit two-thirds of the light, and this will not be more than one-third of the incident *green* light or two-ninths of the incident *white* light. So that half the plate can transmit two-ninths of the light and the other half one-ninth of the light, giving an average for the plate of three-eighteenths, or one-sixth. This, then, is the *maximum* which a plate with correct filters can transmit.

Measurements of the amount of light transmitted by the various commercial screen-plates (uncoated with emulsion) gave the following results :—Autochrome, 7.5 per cent. of the incident light; Thames, 12 per cent.; Omnicolore, 10 per cent.; Dufay, 21 per cent.

As regards the fineness of structure necessary in order that the image on the screen should appear continuous in colour when viewed at a distance of say 8 inches, the separate units require to be 1-15th mm. diameter (1-375th in.). In the case of such transparencies projected from 3 ins. to 10 ft., that is 40 diameters, the structure will be invisible at a distance of 25 ft. For invisibility at 12½ ft. the units require to be 1-800th in. In the case of the commercial screens the size of the units were found to be as follows :—Autochrome, 0.015 mm.; Thames, 0.1 mm.; Omnicolore, 0.05 to 0.08 mm.; Dufay, 0.06 to 0.1 mm. The grain of the Autochrome being irregular and therefore including clumps of grains of one colour it should be of greater fineness than that of a regular screen; each unit should be about one-third the diameter of that in the regular grain screen. This "clumping" of the grains necessarily follows from the law of probability and is not due to imperfect mixing.

For measuring the absorptions of the unit colour elements of the screen the authors employ a direct method, arranging an apparatus so that a powerful beam of light can be projected through a microscope. Using an oil immersion condenser and 1-12th in.

oil-immersion objective, we get a magnification at about 24 ins. from the objective of 250 diameters, which the use of a low-power eye-piece converts into 1,000 diameters. At the same time the illumination is considerable. Projecting the images of the screen-plate units (about ½ in. diameter) upon the slit of a spectro-photometer, they are able to measure the actual absorption curves of the unit filters.

The minimum size of grain is governed by several factors :—1. The thickness of unit necessary to obtain sufficient depth of colour. Thickness of the unit leading to falsification of the colours owing to parallax (this factor alone conditions the diameter of each unit). 2. Irradiation in the emulsion film.

The chief defect in the emulsion with which the screen-plate has to be coated is a gap in the blue-green, which accentuates any lack of overlap between the blue and green filter transmissions.

The compensating filter requires to be adjusted so that when photographing a grey or neutral tint an equal deposit is produced under each of the three filter-units. This is the "second black condition."

The final effective speed of a screen-plate is governed by :—1. Speed of the emulsion; 2. Multiplying factor of the screen; and 3. Multiplying factor of the compensating filter. For the commercial screen-plates these factors are found by the authors to be as follows :—

	Autochrome.	Thames.	Omnicolore.	Dufay.
Emulsion speed Watkins	35	120	22	13
Screen factor	12	8	7	5
Compensator factor	2	1½	1¼	1½
Effective speed	1½	10	2½	2

In conclusion, the authors thus summarise the conditions which must be fulfilled in preparing a successful screen-plate :—

(1) The size of the units. For regular screens, these should not be larger than 1-300th in., nor smaller than 1-600th in. For irregular-grain screens, not larger than 1-900th in. nor smaller than 1-2,000th in. It is quite needless to strive for exceedingly small units.

(2) The interstices. If these exist at all they *must* be filled in; white interstices are fatal, even if they occupy only 1-20th of the area of the screen-plate.

(3) The colours of the units. These must be primary, red, green, and blue-violet, and conform to the conditions already explained.

(4) The relative area occupied by each colour. This must be adjusted to fulfil the first "black condition."

(5) The emulsion. This must be coated, for which purpose the varnishes will have to be selected, as they must not act upon it. Turpentine and ether, especially the former, are inadmissible as solvents; resin varnishes are suspect.

(6) The sensitising. This must be performed so that the actions under the red and green filters are equal.

(7) The compensator. This must finally be adjusted to fulfil the second "black condition."
—"Phot. Journ.," May, 1910, p. 197; "B.J." Colour Supplement, June 3, p. 45; July 1, p. 52; Aug. 5, p. 62; and Sept 2, p. 68, 1910.

Patterns of Screen Plates.—C. Welborne Piper, in an examination of the merits of the various possible patterns of screen-plate structure as regards involving the least length of boundary lines between the filter elements, shows that this length is reduced by suitable choice of unit. His results may be summed up by the following table, in which the figures show the length in millimetres of the dividing lines on a piece of screen measuring 10 mm. by 30 mm., the width of lines being 1 mm., while the smaller screen units are all equal to 1 square mm. :—

Line Screens.	
Single line screen	300
Alternate lines and squares	450
Mosaic Screens.	
Hexagons	558
Squares	600
Triangles	684
Diaper Screens.	
Circles	708
Hexagons	744
Squares	800
Triangles	912

—"B.J.," Colour Supplement, Nov., 1909, p. 84.

Lumière Screen-Plates.—The Société Lumière has patented a method of preparing a mosaic filter-screen for one-exposure colour photography, the principle of the method being the use of mixtures which are precipitated by one another as dyes forming the filter-elements. The following is an example of the process. On a plate or film covered with gelatine, lines or dots are printed in fatty ink, the resist thus formed covering about two-thirds of the surface. The plate is then tinted orange, for example, with a solution of eosine scarlet; then, after drying, the surface is washed with a solvent to remove the fatty ink. Further series of lines or dots are then printed on the surface with fatty ink which will partially cover the parts already tinted and partially also the parts left free, and which were previously protected by the first printed impression since removed.

The plate is then immersed in a mixture of yellow-metanile S and of cyanine B, to which is added an iron salt. This mixture tints the free parts of the layer green, and the iron salt which it contains will prevent its penetration in the parts originally coloured with the eosine scarlet, by reason of the insolubility of the composition, which tends to form by the reaction of the eosine scarlet on the iron salt.

After desiccation the fatty ink is removed by washing with a solvent, and the layer is immersed in a basic violet colouring matter, methyl-violet for example, which will tint the last portions of the

surface left free and the precipitation of which by the acid colouring matters previously employed (eosine scarlet, yellow-metanile, cyanine) will prevent penetration in the parts already coloured. The plate is finally washed in alcohol to dissolve the precipitates formed by the successive reactions.—Eng. Pat., No. 29,273, 1909; "B.J.," July 22, 1910, p. 556.

In two later patents, Nos. 4,912, 1910, and 5,377, 1910, the Société Lumière claims a process similar to the above, but without the use of tacky resist; the dye mixtures themselves can be successively impressed on the support, and as each colour is unable to penetrate the parts already dyed, complete joining of the colours is obtained without special precaution. This method can be carried out by spraying the colours on to the plate, the two first colours being applied in this way and the plate being dyed by immersion for the third.—"B.J.," July 22, 1910, p. 557.

Mosaic Screen-Plates.—F. Martin-Duncan prepares a grain screen-plate, the elements of which are composed of particles of gum-resins, such as tragacanth and other gums containing calcium salt of bassorin.

The support of glass or celluloid is first coated with gelatine, then with a transparent varnish, for example, a solution of dammar 115 gms. in benzole 1,000 c.c.s., or with a thin layer of glycerine. Upon this coating, while still moist and slightly adhesive, the stained particles of the gum-resin are applied, and the plate is then given a protective coating of a waterproof transparent varnish composed of

Shellac solution, 20 per cent .	160 c.c.s.
Ammonia, 0 880	30 c.c.s.
Methylated spirit . .	320 c.c.s.

On this the sensitive emulsion is coated.

In another method of preparing the colour screen a coating is given of a solution of fish-glue in water containing also ammonium bichromate, sugar, albumen (of one egg), and gum-dragon. After drying the plate is exposed behind a key-plate formed by two ruled gratings placed one on the other at an angle so as to form diamond or lozenge-shaped openings. After exposure to light the sensitive plate is developed in hot water, and the remaining image stained with one dye, which is fixed by a mordant. A second coating of the fish-glue mixture is given, and the dried plate registered under the key-plate, so that the opaque lines on the latter cover the stained portion of the sensitive plate. A second exposure is given, followed by staining with a second dye, and, finally, a third coating of the fish-glue mixture, is exposed through the coated plate itself, so that the whole surface of the latter, after staining with a third dye, is completely filled with the colour elements.—Eng. Pat. No. 50, 1909; "B.J.," Jan. 28, 1910, p. 69.

Shellac Grain Screen-Plate.—A further patent has been taken out by J. H. Christensen, additional to No. 20,971 of 1908 ("B.J.A.," 1910, p. 598, where the name of the patentee is incorrectly given as J. Herman). The later patent describes a further improvement in

the manufacture of a shellac grain screen by precipitating particles of shellac from solution so as to obtain them in a medium in which they are completely or practically insoluble.—Eng. Pat. No. 21,007, 1908; "B.J.," Nov. 12, 1909, p. 878.

Geometrical Screen-Plate.—Carl Spath has patented a process of preparing a three-colour screen-plate from a line-screen original. A plate is sensitised with bichromate, printed under the line screen, and dyed in a mixture of two dyes, one of which attaches to the exposed and the other to the unexposed parts of the gelatine. The excess dye is washed out, the plate re-sensitised with bichromate, and again printed from the line screen, this time at an angle, being finally washed and dyed.—Eng. Pat. No. 3,601 of 1909; "B.J.," Dec. 3, 1909, p. 936.

Screen-Ruled Roll Film.—Colin N. Bennett gives photomicrographs of a screen-film, stated to be made by the Vereinigte Kunstseidefabriken A.G. (presumably by one or other of the processes described in "B.J.A.," 1910, p. 599). The film is of very fine ruling, of less opacity than the Autochrome, whilst the prevailing tint is a very slight tinge of green.—"B.J.," Colour Supplement, Sept. 2, 1910, p. 66.

SCREEN-PLATES ON THE MARKET.

THE LUMIÈRE AUTOCHROME.

Extra Sensitising of Autochromes.—In order to obtain Autochrome plates of sensitiveness sufficient for instantaneous exposures Ch. Simmen subjects them to a further colour-sensitising, as already suggested by Thovert ("B.J.A.," 1910, p. 602). The dyes found best for this purpose are pinaverdol, pinacyanol, and pinachrome, these three being used together in proportions which require to be found by preliminary trial. An exact formula cannot be given; in some cases the proportion of pinaverdol to pinacyanol is 8 : 1, in others 7 : 4. It is thus necessary to start first with a mixture of 1 of pinacyanol to 3 of pinaverdol, and to add more of the first if the greens are predominant, or of the second if the reds predominate. Equilibrium in this respect having been obtained, one part of this bath is mixed with one part of pinachrome solution of the same strength, namely, 1 : 1,000.

In working, sensitising with an aqueous solution is not one to be recommended—the plates do not keep so well, and frequently stains are caused. The best bath is one made up with 30 per cent. alcohol, which strength has been found to be without injurious effect upon the varnish of the plates. The solution is rendered distinctly alkaline by addition of 1 c.c. of ammonia of 22 deg. strength per litre, a small proportion, yet sufficient. The composition of the bath is thus as follows:—

Distilled water	66 c.c.s.
Ethyl alcohol, 90 deg.	33 c.c.s.
Ammonia, 22 deg.	0·1 c.c.
Dye (1 per cent. solution in alcohol)	2 c.c.s.

The above quantity will suffice for four quarter-plate Autochromes

sensitised in succession. This bath may be made in bulk, and will keep indefinitely in well-corked bottles filled with the liquid and placed away from light.

Each time before use it is strengthened by addition of ½ c c of the dye solution and ½ c c of 1 per cent ammonia; *after use*, a few c c s of 30 per cent alcohol are added to make up the volume lost, the bath being then filtered through cotton-wool. The variations which can creep in in preparing the bath do not affect the results to an appreciable extent It is important to observe the greatest cleanliness and freedom from dust, and it is well to use the dishes only for this special purpose, rinsing them beforehand with acid permanganate solution, and keeping them constantly covered with a piece of card during use The sensitive plates are immersed in the bath, allowing 100 c c s for each quarter-plate The time of immersion is exactly five minutes, irrespective of the temperature The bathed plates are carefully drained and put to dry, with absolute exclusion of light Perfect drying, essential to the process, was at the first one of the greatest difficulties of the process, but a very simple method was found in the use of a neutral fluffless blotting paper —" B J ," Colour Supplement, Sept 2, 1910, p 65

Autochrome Portraiture by Magnesium Light —W Weisseimel recommends the slow burning timelight powder of Dr Krebs for portraiture and other exposures indoors on the Autochrome plate. A light yellow filter is required, one made with "diamine" varnish was found suitable The light of the powder is diffused through a screen of tracing cloth or paper — "Phot Mitt ," Heft 1, 1910, p 5, "B J ," Colour Supplement, Feb 4, 1910, p 9

Photo micrography on Autochromes —Dr O Lederer advises making one or two trial or pilot exposures, say five on a single plate, and after development of these, to select the one giving the best result for the exposure of the complete subject There is no necessity to use an Autochrome plate for these trial exposures it is sufficient to use an ordinary dry plate, and to obtain the correct exposure for the Autochrome by multiplying the exposure found best with the dry plate by a factor ascertained from one or two exposures made on the dry plate after obtaining a perfect result on an Autochrome —" Wien Mitt ," Mar , 1910, p 113, " B J , ' Colour Supplement, May 6, 1910 p 33

THE DUFAY DIOPTICHROME PLATE.

Properties of the Dufay Plate —John H Pledge has published results of tests of the first plates commercially used under the patents already published (" B J A.," 1910, p 596, and 1909, p 643) Fig 1 shows the structure of the plate, which is most regular and mechanically perfect The green bands, G, and the red and blue areas, R and B, are in the order G, R, B as regards visual brightness The faint areas, A, produced by the crossing of the red and green, are a degraded green, and may be considered as part of the G bands

The width of the green line averages 0 09 mm (1 330 in), and the

red and blue areas 0·11 mm. (1-220 in.). The ratio of the relative areas occupied on the screen are blue 5, green 7, red 4.

Of the filter-elements, the blue, cutting at λ 4,950, although it absorbs the green well, transmits a considerable amount of red.

Fig. 1.
Dufay Dioptichrome screen-plate x 100.

The green filter, of rather shallow cut, extends from about λ 4,500 to λ 5,900, with a small transmission in the red about λ 6,500. The red is a sharp-cut filter, with good absorption of green, but has a noticeable transmission of blue about 4,600.

The above applies to the screen-plate first issued for use with a separate panchromatic plate.—"B.J.," Colour Supplement, Nov. 5, 1909, p. 81.

The working instructions for the Dufay plate, issued by the English agents, The Autotype Company, give the following formulæ :—

Developer and Redeveloper.

Water	1,000 c.c.s.	35 ozs.
Metol	6 gms.	90 grs.
Sulphite of soda recrystallised	75 gms.	2½ ozs.
Hydroquinone	2 gms.	30 grs.
Bromide of potassium	2 gms.	30 grs.
Ammonia 0·880	12 c.c.s.	3½ drs.

(Ammonia at 0·880 being volatile and liable to loss, it is a con-

venient practice to dilute it on receipt with an equal bulk of distilled water and then use double the quantity indicated above.)

For use mix with an equal bulk of water. Time of development at 60 deg. F., three minutes. Use a fresh lot of solution for each plate. Commence development in the dark, and after about one minute examine the plate by a green safe-light. When sufficiently developed wash for about 20 seconds in running water, and transfer to the reversing solution.

Reversing Solution.

Water	1,000 c.c.s.	35 ozs.
Bichromate of potash	5 gms.	75 grs.
Sulphuric acid	10 c.c.s.	170 mms.

As soon as the plate is in this bath proceed by full daylight. Reversing is complete in about two minutes; wash in running water until the yellow bichromate stain disappears.

The plate is then redeveloped in the same lot of solution used for the first development. Redevelop until the action is complete, which will be in from three to four minutes in daylight.

The plate is then washed for three or four minutes in running water, though longer will not harm it. After drying it is best to varnish with a solution made as follows:—

Gum dammar	1 oz.
Benzole	10 ozs.

This is flowed over the plate while the latter is held in the hand, the excess poured off at one corner, and the plate, after drying, which takes only a minute or so, bound up lantern slide fashion.

Under-exposure causes a dull and buried appearance of the picture after reversal and redevelopment; the colours are deficient in brightness, and the shadow detail is missing. Some slight improvement is obtained by the use of Farmer's reducer.

Over-Exposure.—The image appears too quickly on the first development, the ultimate result being a thin image with a washed-out appearance. This result may be improved to a certain extent by intensification. Bleach thoroughly in:—

Water	800 c.c.s.	20 ozs.
Alcohol	200 c.c.s	5 ozs.
Bichloride of mercury	40 gms.	1 oz.

Then wash for five minutes and blacken in the following solution:—

Water	100 c.c.s.	10 ozs.
Sulphite of soda recrystallised	10 c.c.s	1 oz.

H. Essenhigh Corke describes his first experiences with the Dufay plate, which he finds requires practically the same exposure as the Autochrome. In the case of an under-developed plate giving a heavy and dense colour positive, reduction with ferricyanide of hypo, followed (after washing) by intensification with mercury, gave excellent brilliance and colour values.—"B.J.," Colour Supplement, Aug. 5, 1910, p. 57.

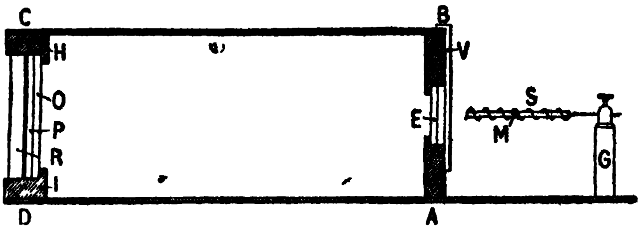
THE THAMES PLATE.

Thames Print-out Plate for Duplicates.—O. S. Dawson and C. L. Finlay propose that the negative made by the "Thames" separate method through the filter screen be printed on a "positive-making colour plate"—that is, a Thames colour screen coated with transparent slow emulsion. This is placed film to film on the negative, and is registered in the *complementary* colours. This can be done by the light of ordinary gas or candle, using, however, a piece of ground glass to distribute the light. An exposure is then made to strong light, and the plate developed and fixed, and now *on one glass* there is a transparency in colour of the original scene or object.

The slow plate may be a bromide or P.O.P. For the former the exposure is made by magnesium. For the P.O.P. either an exposure is made by meter or in a special kind of printing frame which will permit of examination as in ordinary P.O.P. printing. It will be seen that in this method the registration is made with the negative *before* exposure instead of with the positive after exposure.—"B. J.," Colour Supplement, June 3, 1910, p. 42.

COPIES OF SCREEN PLATE TRANSPARENCIES.

Copies of Autochromes by Magnesium Light.—A. Seyewetz has described the apparatus devised by MM. Lumière and himself for securing a constant and readily obtainable light by which to print from an Autochrome on to an Autochrome plate without a camera. A rectangular wooden box A B C D, 40 cm. long, light proof, and blackened inside to avoid reflections, has in its back C D an opening in which is fitted a special screen E, to give an exact



orthochromatic effect with the magnesium light. This aperture can be opened and closed at will with the aid of a shutter V, which slides in a groove.

In the back of the box is put a closed frame H I, in which is placed first the Autochrome O, to be reproduced glass side in front—*i.e.*, the surface C D—and also the sensitive Autochrome plate P, facing glass side in contact with the Autochrome, and then the usual black cardboard. The frame is closed with the aid of the shutter R.*

* This box can be substituted by an ordinary camera (from which the lens has been taken away) having a sufficient opening provided with a holder deep enough to carry two superimposed plates.

A movable support G carries a spiral of iron wire S, placed horizontally, in which the magnesium ribbon M is placed during the burning. The iron wire spiral is meant to give the necessary rigidity to the ribbon. The support is placed at a certain distance from the front of the box, and in such a way that the magnesium ribbon is on a level with the centre of the screen.

The iron-wire spiral must have a diameter of 0.3 to 0.5 mm., and be fitted in such a manner that there is one turn of the spiral per centimetre of magnesium ribbon

Magnesium ribbon is measured to a length of from 10 to 20 cm. for a ribbon of 2½ mm. breadth, as required by the density of the Autochrome to be reproduced It is folded in the middle in order to obtain half the length, and it is placed inside the spiral of iron wire, the *surface of the ribbon being in a vertical position.*

If, for instance, a magnesium ribbon is taken of 16 cm. length, this, folded in two, will be 8 cm , and will have to correspond with eight revolutions of the spiral

It is necessary to observe this rule so that the conditions of combustion of the magnesium are invariable, greater or less rapidity of burning being likely to spoil the results

The spiral support is so placed that the end of the magnesium ribbon is at a distance of 5 cm from the screen and exactly in the centre of the box. With the shutter V closed, the magnesium is ignited and the shutter immediately raised The combustion finished, the plate is treated as usual

The exposure—that is to say, the length of the ribbon to be used—can easily be determined by a previous trial. It must be as exact as possible to obtain a good reproduction

Of course, the operation has to be done with all other light excluded except the magnesium

Care should be taken not to substitute copper or brass wire for the iron wire. Also the diameter of 0 3 to 0 5 mm. must be kept to as closely as possible, as this is suitable for a magnesium ribbon of 2½ mm. breadth. The spiral is simply obtained by winding an iron wire around a cylindrical rod of 3 or 4 mm diameter, so that the turns of the spiral are equal, the rod is withdrawn and the spiral slightly stretched When the magnesium ribbon has been placed inside it is stretched again until it has the required dimension—that is to say, until the coils of the spiral are successively separated by a distance of 1 cm.—"B J ," Colour Supplement, Jan 7, 1910, p 1.

Carl Konig gives the following formulæ for a compensating light-filter for use when making copies of autochromes on sensitive autochrome plates using magnesium ribbon —

SOLUTION No 1.

Gelatine (7 : 100)	40 c c s.
Tartrazine (1 : 500)	4 c.c s.
Pheno-saffranine (1 : 7,000)	4 c.c s.
Aesculine (0.4 gm in 35 c.c s. water plus 3 drops ammonia)	35 c.c s.

SOLUTION NO. 2.

Gelatine (6 : 100)	100 c.c.s.
Rapid filter yellow K (1 : 200)	2.5 c.c.s.
Water	17.5 c.c.s.

Solution No. 1 was flowed on glass in the proportion of 8 c.c.s. per 100 sq. cm.; solution No. 2 in the proportion of 7 c.c.s. for the same area. The two filters were dried and bound film to film for use. In using this filter it should be noted that MM. Lumière direct the use of 16 cm. of magnesium ribbon held in a spiral of 1 cm. width for an average transparency. In using the above filter under otherwise identical conditions 3 cm. of ribbon was used. It is therefore better to use the ribbon in a spiral ½ cm. in width in order to prevent the magnesium band falling out.—"Phot. Rund.," Heft 11, 1910, p. 125; "B.J.," Colour Supplement, Sept. 2, 1910, p. 67.

Copies of Autochromes.—A. von Hubl has represented the conditions under which a copy of one screen-plate transparency may be made on another similar plate in a series of diagrams. From these and practical trials it is concluded that the only means of obtaining a full colour reproduction in the copy is by introducing a certain degree of unsharpness. The best results are obtained by reproduction by transmitted light, although the variations in daylight give rise to difficulty. The Lumière apparatus, although it does not give such good results, is nevertheless very convenient in use.—"Wien. Mitt.," June, p. 249, and July, p. 309, 1910; "B.J.," Colour Supplement, Aug. 5, 1910, p. 59.

Developing Autochrome Copies.—F. Monpillard lays stress on the important part played by the developer and by its temperature in securing satisfactory results. With pyrogallic acid the images tend invariably towards hardness, compared with the original, whilst the fine and light half-tones are eaten out, or scarcely shown, the heavier shadows lacking transparency. By using metoquinone in place of pyro these drawbacks are avoided, and the results obtained are more harmonious, and readily give reproductions corresponding with the original, so long as care is given to the temperature of the developer, which should not be lower than 62 deg. F. nor higher than 70 deg. F. If too cold, the developer tends to give hard results; if too warm, the reproduction is flat.

On the other hand, the plate having been fully exposed, it is always well to commence development with a weak bath—namely, 5 c.c.s. of the concentrated solution mixed with 45 c.c.s. of water. This is a good proportion in the majority of cases. If the exposure has been correct the whole of the image will appear readily within about 40 seconds. We continue to develop for about two minutes, and then add a further 2½ c.c.s. of the concentrated developer, and proceed with development until those parts of the image which should correspond to the pure white of the original appear quite black by reflected light, whilst the delicate half-tones appear slightly whitish. In cases of slight under-exposure the best thing to do, after allowing the developer to act for about 80 or 90 seconds, is to

add a further quantity of concentrated solution, and to develop for a total time of from three to four minutes. It should be repeated that the best results will always be obtained with a full exposure.

If, after reversal and the second development, the image appears slightly grey all over, the plate should be allowed to dry, and then treated with duo precaution in a reversing bath diluted in the proportion of 1 part of bath to 20 of water. Here the greyish veil will disappear, leaving a bright image. If the second development is properly done there is usually no reason to fear this veil, and it is scarcely ever necessary to revert to intensification.—"Bull. Soc. Fr. Phot.," March, 1910, p. 104; "B.J.," Colour Supplement, April 1, 1910, p. 25.

Trichrome Lantern Slides from Autochromes.—Colin N. Bennett gives full directions for preparing analysing screens with which to produce the set of colour-sensation negatives from an Autochrome, from which negatives three-colour lantern slides by the triple-film method may be prepared. The dyes required are :—Tartrazine (Hoechst), toluidine blue (Hoechst), naphthol green (Hoechst), rhodamine pink, eosine (water soluble), metanile yellow, acid green.

These are made up into stock solutions as follows :—

"Yellow," 3 per cent. tartrazine solution mixed with equal bulk of a cold saturated solution of metanile yellow, the latter made the day before use and the clear part only used.

"Red," 3 per cent. eosine solution mixed with an equal bulk of "Yellow," made as above.

"Pink," 3 per cent. solution of rhodamine.

"Stock blue," 3 per cent. solution toluidine blue.

"Blue-violet," equal parts of "Pink" and "Stock blue."

"Green," 3 per cent. solution naphthol green mixed with equal bulk of "Yellow."

"Blue green," 3 per cent. solution acid green mixed with twice its bulk of "Stock blue."

The analysing screens are made as follows :—

Quarter-plates (if this be the size of Autochrome to be reproduced) are thoroughly fixed and washed. For the red screen soak one plate ten minutes in the "Red" dye bath, another in the "Pink" bath. Rinse each quickly under water, shake off adhering water, dry, and bind face to face together.

For the green screen dye two plates each in the "Green" bath.

For the blue screen one plate is dyed in the "Blue-violet" bath and bound up with a cover glass.

To test the screens proceed as follows :—Red screen should be bright dark scarlet, something between the tint of a three-colour red filter and a piece of light dark-room ruby glass. Place it against the blue screen and observe a glowing incandescent gas mantle through both. The mantle should be quite invisible or very faint green. If blue, blue-green, or violet, the red screen is deficient in yellow and should be re-made.

The green screen (most difficult to adjust) is tested by placing against the red screen (previously adjusted) and viewing the gas mantle. This should show only a faint brown colour, not orange.

Next view mantle through the blue and green together; these should pass still less light, and that of dull indigo colour. Blue-green must on no account pass—the green screen must be re-dyed deeper until both orange and blue-green cease to pass on making above tests.

For making the exposures incandescent gas is used, a suitable plate being the Wratten "Panchromatic."

For holding the screen at a convenient distance from the Autochrome it is a good plan to make a box with a couple of grooves outside on either side of an aperture to take the screen. A sliding shutter is arranged behind the aperture to give the exposures and a frame arranged a little further back inside the box, the printing frame holding the Autochrome and the sensitive plate being pushed against this stop frame when making each exposure.

To find the ratio of exposure through each screen take a spoilt Autochrome and remove the emulsion film by wetting the plate. Place an ordinary good negative in the printing frame, on this lay a mask, covering all but one-third of the negative; on this the Autochrome plate, screen side up, and lastly the Panchromatic plate, film side down of course. Having put the exposing box at the distance to be adhered to from the source of light—say 18 ins.—put in the red screen and give an exposure of, say, 15 seconds. Then insert the green screen and reverse the mask so that a different third of the plate is exposed, give a second trial exposure—about four to six times that for the red. Finally, using the blue screen, give an exposure of the remaining third of the plate, trying the same time as through the red Repeating this test until all three sections develop up in metol-hydroquinone (maker's formula) to the same intensity, we get the ratio for the three exposures.

The making of the three negatives from the Autochrome is now straightforward work. The Autochrome is placed film side up in the printing frame, the Panchromatic plate laid on it, film to film, and exposure given through the red screen, this being repeated on two further plates for the blue and green. The making of triple-film positives from this set of negatives is done by the methods in use before the advent of screen-plates.—"A.P.," Nov. 9, 1909, p. 454.

Some hints may be given on the making of the colour monochromes for the triple film process. Kodak film can be used for the purpose, but the non-curling coating of gelatine on the reverse side must be removed by unwinding the film from the spool by ordinary artificial light, pinning it, emulsion side down, to clean paper, removing the black paper, and applying warm water with a sponge to swell the gelatine coating, after which a wet nail brush will allow of the non-curling coating being scrubbed away. A spirit sensitiser is the best for rendering the film sensitive. Printing is done through the celluloid, judging of exposure by the darkening of the silver bromide. When details in the high-lights are just visible when the emulsion side of the film is viewed in the printing frame, exposure will have been sufficient. Development is done at 110 deg. F., the silver image cleared off in a strong hypo bath to which a little ferricyanide has been added It now remains to dye up the films,

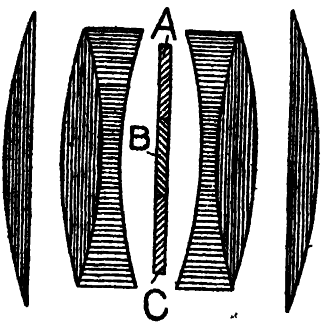
and for their identification that through the green-record negative should have one notch cut in it when loading into the frame, that through the blue negative two notches, whilst that through the red may be left unnotched. The dye baths used are the "Blue-green" for the unnotched film, "Pink" for the one-notch, and "Yellow" for the two-notch.—"A.P.," Nov. 9, 1909, p. 478.

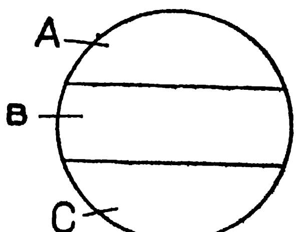
Paper Prints from "Omnicolore" Transparencies.—L. Didier states that the three-colour method given by him for preparing prints from Autochrome transparencies by the pinatype process ("B.J.A.," 1909, p. 660) is satisfactory with "Omnicolore" transparencies. The screen structure disappears.—"Phot. Couleurs," Sept., 1909, p. 170; "B.J.," Colour Supplement, Jan. 7, 1910, p. 8.

The Bleach-out Process.

Bleach-out Processes.—Dr. J. H. Smith, in a paper before the Royal Photographic Society, reviewed past literature of the bleach-out process, and described his own later experiments in producing a more sensitive and colour-true paper of this type.—"Phot. Journ.," April, 1910; "B.J.," Colour Supplement, May 6, 1910, p. 34.

Berthon Colour Process.—R. Berthon has invented and patented a process in which colour filter elements in the support of the emulsion are dispensed with. Panchromatic emulsion is coated on to glass or celluloid, the uncoated side of which is impressed with





an embossed, fluted, or lenticular structure. The purpose of this material will be understood from the description of the process proper:—A lens is provided at its optical centre with a diaphragm-plate in which are three apertures, A, B, and C, fitted with red, green, and violet screens respectively. The image given by this lens is the same as that produced by a lens without the three-colour diaphragm—as regards colour. But when the image is viewed it is found that the brilliancy of the various screens of the diaphragm varies in accordance with the tints of the part of the image in question and the components of this tint. Thus in the case of a red point only the red screen is

luminous; for a yellow point, only the red and green screens are luminous, the violet screen appearing black, and so forth. The result is that, if at each point of a single sensitive surface it is possible to record a complete and infinitely small image of the objective with its three screens, a three-colour selection is obtained which is analogous to that given by processes with juxtaposed coloured pigments. This selected image, when projected by means of the apparatus which has served for the exposure, will reproduce the exact colours of the original.

The images obtained by this process may be utilised for the projection in different ways; when merely developed after exposure through the objective with three-colour diaphragm, a plate or film of this kind, when replaced in the exposure apparatus, gives a negative image in which the colours of the objects are represented by their complementary colours; reversed after the first development, the projected image is positive, and the colours the actual colours; finally, the direct negative image and the inverted image may be projected with the objective with which the picture was taken, the screens of the diaphragm being replaced, however, by screens of complementary tints. In the first case a negative projection is obtained, but its tints are similar to these of the original, and in the second case a positive projection is obtained, with colours complementary to those of the objects photographed.—"Phot. Couleurs," Dec., 1909, p. 244; "B.J.," Colour Supplement, Feb. 4, 1910, p. 15.

M. Berthon has further described the process in his application for patent rights in Great Britain.—Eng. Pat. No. 10,611, 1909; "B.J.," June 3, 1910, p. 421.

KEY TO THE ABBREVIATIONS OF JOURNALS QUOTED IN "EPITOME OF PROGRESS," WITH ADDRESSES.

"A. P." .. .. "The Amateur Photographer and Photographic News."
Hazell, Watson & Viney, Ltd., 52, Long Acre, London, W.C.

"Amer. Phot." .. "American Photography."
361, Broadway, New York City, U.S.A.

"Ann. Gen. Phot." .. "Annuaire Général de la Photographie."
Plon-Nourritt & Co., 8, Rue Garancière, Paris.

"Ann. Chem. Phys." "Annales de Chimie et de Physique."
Masson et Cie., 120, Boulevard St. Germain, Paris.

"Apollo" .. .. "Apollo."
Albrechtstrasse 39b, Dresden A 10, Germany.

"Atelier" .. .. "Das Atelier."
W. Knapp, Halle a/Saale, Germany.

"Aust. Phot. Journ.".. "Harrington's Photographic Journal."
Harrington & Co., Ltd., 386, George Street, Sydney, Australia.

"Aust. Phot. Rev." .. "Australian Photographic Review."
Baker & Rouse Proprietary, Ltd., 379, George Street, Sydney, Australia.

"B. J." .. .. .. "The British Journal of Photography."
Henry Greenwood & Co., 24, Wellington Street, Strand, London, W.C.

"B.J.A." .. .. "The British Journal Photographic Almanac."
Henry Greenwood & Co., 24, Wellington Street Strand, London, W.C.

"Photo-Notes." .. Discontinued.

"Berichte" .. .. "Berichte der Deutschen Chemischen Gesellschaft."
R. Friedländer & Sohn, Karlstr. 11, Berlin.

"Bild" .. .. .. "Das Bild."
Neue Photographische Gesellschaft, Steglitz, Berlin.

"Bull. Belge".. .. "Bulletin de l'Association Belge de Photographie."
Ch. Puttemans, Palais du Midi, Brussels.

"Bull. Fr. Chem. Soc." "Bulletin of the French Chemical Society."
Masson et Cie., 120, Boulevard St. Germain, Paris.

"Bull. Soc. Fr. Phot." "Bulletin de la Société Française de Photographie."
Gautier-Villars et Fils, Quai des Grands-Augustins 55, Paris, France.

"Bull. Phot." .. .. "Bulletin of Photography."
210-212, North 13th Street, Philadelphia, U.S.A.

"Cam." .. .. "The Camera."
1317, Arch Street, Philadelphia, U.S.A.

"Cam. Craft" ..	"Camera Craft." 713/715, Call Building, San Francisco, Cal., U.S.A.
"Cam. Work" ..	"Camera Work." Alfred Stieglitz, 1111, Madison Avenue, New York, U.S.A.
"Cent. Zeit." ..	"Central Zeitung für Optik und Mechanik." 7, Bülowstr., Berlin, W., Germany.
"Chem. News"	"The Chemical News." E. J. Davey, 16, Newcastle Street, Farringdon Street, London, E.C.
"Chem. Zeit." ..	"Chemiker Zeitung." Dr. G. Krause, Cöthen (Anhalt), Germany.
"Compt. Rend."	"Comptes-Rendus des Séances de l'Académie des Sciences." Gautier-Villars, 55, Quai des Grands-Augustins, Paris.
"D. Phot. Zeit."	"Deutsche Photographen-Zeitung." K. Schwier, Weimar, Germany.
"Der Amateur"	"Der Amateur." Mondscheingasse 6, Vienna VII, Austria.
"Der Phot." ..	"Der Photograph." Benno Fernbach, Bunzlau.
"Eder's Jahrbuch"	"Jahrbuch für Photographie und Reproduktionstechnik." W. Knapp, Halle a/S., Germany.
"Il Prog. Foto."	"Il Progresso Fotografico." R. Namias, 27, Via Boccaccio, Mailand, Italy.
"Journ. Chem. Soc. Trans."	"Journal of the Chemical Society: Transactions." Gurney & Jackson, 10, Paternoster Row, London, E.C.
"Journ. Phot. Soc. Ind."	"Journal of the Photographic Society of India." 40, Chowringhee, Calcutta, India.
"Journ. Roy. Micr. Soc."	"Journal of the Royal Microscopical Society." Williams & Norgate, 14, Henrietta Street, London, W.C.
"Journ. S. C. I."	"Journal of the Society of Chemical Industry." Vacher & Sons, Great Smith Street, London, S.W.
"Journ. Soc. Arts"	"Journal of the Society of Arts." G. Bell & Sons, York House, Portugal Street, London, W.C.
"Knowledge" ..	"Knowledge." King, Sell & Olding, Ltd., 27, Chancery Lane, London, W.C.
"Le Phot." ..	"Le Photo Journal." 22, Rue Vurenna, Paris.
"Mon. Phot." ..	"Le Moniteur de la Photographie." 17, Rue des Moines, Paris, France.

"N. Z. Phot"..	"Sharland's New Zealand Photographer." Lorne Street, Auckland, N.Z.
"Nature" ..	"Nature." Macmillan & Co, Ltd, St Martin's Street, London, W C.
"Oest. Phot. Zeit"	"Oesterreichische Photographen Zeitung" Oesterreicher Photographen Verein, Vienna III/I.
"Opt."	"The Optician" Gutenberg Press, Ltd, 123, 124 & 125, Fleet Street, London, E C.
"P. M." ..	"The Photo Miniature." 122 East Twenty fifth Street, New York, U.S.A
"Pharm Journ."	"The Pharmaceutical Journal" 72, Great Russell Street, London, W.C.
"Phil. Mag" ..	"The Philosophical Magazine." Taylor & Francis, 7½, Red Lion Court, Fleet Street, London, E C.
"Phil. Trans."	"Philosophical Transactions of the Royal Society." Harrison & Sons, 45 St Martin's Lane, London, W C.
"Phot." ..	"Photography and Focus" Iliffe & Sons, Ltd, 20, Tudor Street, London, E C.
"Phot. Chron."	"Photographische Chronik." W Knapp, Halle a/Saale, Germany.
"Phot. Couleurs"	"La Photographie des Couleurs." 118, Rue d Assas, Paris.
"Phot. Indus"	"Photographische Industrie." 31, Blücherstr, Berlin S 61, Germany.
"Phot. Journ."	"Journal of the Royal Photographic Society of Great Britain" ("The Photographic Journal"). Harrison & Sons, 45, Pall Mall, London, S W.
"Phot. Korr."..	"Photographische Korrespondenz." Backerstrasse 12, Vienna I, Austria.
"Phot. Kunst"	"Photographische Kunst." Rennbahnstrasse 11, Munich, Germany.
"Phot. Mitt." ..	"Photographische Mitteilungen." Gustav Schmidt, Konigin Augustastr. 28, Berlin W 10, Germany.
"Phot. Monthly"	"The Photographic Monthly" Dawbarn & Ward, Ltd., 68/74, Carter Lane, Ludgate Hill, London, E.C.
"Phot. Rund."	"Photographische Rundschau" W. Knapp, Halle a/S. Germany.
"Phot. Scraps"	"Photographic Scraps" Ilford Ltd, Ilford, London, E
"Phot. Times"	"The Photographic Times." 39, Union Square, New York City, U S.A.

"Phot. Welt"	"Photographische Welt." (M. Eger), 28, Grimmaischer Steinweg, Leipsic, Germany.
"Phot. Woch." ..	"Photographisches Wochenblatt." 13, Bendlerstr., Berlin W.
"Photo-Era"	"Photo-Era." 383, Boylston Street, Boston, Mass., U.S.A.
"Photo Gazette" ..	"Le Photo Gazette." 14, Rue des Minimes, Paris, France.
"Photo-Revue" ..	"Photo-Revue." 118, Rue d'Assas, Paris VI, France.
"Photographie" ..	"La Photographie." 118, Rue d'Assas, Paris, France.
"Phys. Rev."	"The Physical Review." The Macmillan Company, 66, Fifth Avenue, New York, U.S.A.
"Pro. and Am. Phot."	"The Professional and Amateur Photographer." 222, Washington Street, Buffalo, U.S.A.
"Proc. Roy. Soc." ..	"Proceedings of the Royal Society." Harrison & Sons, 45, St. Martin's Lane, London, W.C.
"Procédé"	"Le Procédé." 150, Boulevard de Montparnasse, Paris XIV.
"Rev. Trimest." ..	"Revue Trimestrielle des Travaux de Recherches." A. Lumière et ses Fils, Lyons.
"Sci. Amer."	"The Scientific American." Munn & Co., 361, Broadway, New York, U.S.A.
"Sonne"	"Sonne." Kaiser-Platz, 18, Wilmersdorf, Berlin.
"St. L. and C. Phot."	Has ceased publication.
"T. Q."	"Telephoto Quarterly." (Ceased publication with issue, March 25th, 1910.
"Wiener F. Phot. Zeit."	"Wiener Freie Photographen Zeitung." Gustav Walter, Alserstrasse 71, Vienna VIII Austria.
"Wien. Mitt."	"Wiener Mitteilungen." Graben 31, Vienna I, Austria.
"Wilson's"	"Wilson's Photographic Magazine." 289, Fourth Avenue, New York, U.S.A.
"Zeit. für Instr." ..	"Zeitschrift für Instrumentenkunde." Julius Springer, Berlin.
"Zeit. für Repro." ..	"Zeitschrift für Reproduktionstechnik." W. Knapp, Halle a/Saale, Germany.
"Zeit. für Wiss. Phot."	"Zeitschrift für Wissenschaftliche Photographie." J. A. Barth, 17, Rofsplatz, Leipsic, Germany.

RECENT NOVELTIES IN APPARATUS.

BY THE EDITOR.

[*These notices are confined to apparatus introduced since the publication of the last Almanac. In all cases the various articles have come under our personal examination, a rule from which we allow no departure.*

The items in this section are indexed in the General Index to Text placed at the end of the volume.]

THE "N.S." NON-FOCAL-PLANE REFLEX CAMERA.

(Made by James A. Sinclair and Co., Limited, 54, Haymarket, London, S.W.)

While the past few years have witnessed an immense advance in popularity of the reflex type of camera, the direction in which makers have shown their enterprise has been strictly along the lines of the first really popular instrument. In these the focal-plane shutter was employed, and almost without a single exception makers have adopted this type of shutter as the only possible one in a camera of the reflector type. And such a course is natural, since the release of the shutter needs to be actuated by the upward movement of the mirror. Obviously the fact that the focal-plane shutter is a fixture in the camera and does not move with the extension of the lens-front or the rise and fall of the lens makes it easier to design a camera of the reflex pattern. The price paid for this facility is made up of a number of things. In the first place, the focal-plane shutter adds to the bulk of the camera. Also its long moving blind is a surface which collects dust readily. But these drawbacks are less serious than others. Apart from bulk, it is less easy to construct a focal-plane shutter which will work with unfailing certainty year in year out, and under extreme variations of heat and cold. It is also more difficult to construct one which the unskilled user cannot derange. And, lastly, there is the further drawback—and one which perhaps the amateur worker does not realise as fully as he might—and that is the difficulty of providing in a focal-plane shutter speeds slower than the fifteenth or tenth of a second, which may be taken as about the slowest which can be obtained with the quarter-plate focal-planes. Most hand-camera work would be the better for a fuller exposure, and for that reason

a reflex provided with a shutter which gives times of $\frac{1}{8}$, $\frac{1}{4}$ and $\frac{1}{2}$ sec. would be an instrument of real advantage as regards results. We may thus attach considerable importance to the introduction of a reflex camera in which the focal-plane shutter is dispensed with and one of the diaphragm type employed.

A camera of this description is just being placed upon the market by Messrs. James A. Sinclair and Co., Ltd., its designation "N.S." indicating its joint designers, Messrs. A. S. Newman and James A. Sinclair. Our report of it is based on the first complete working model, which, at the time of writing, is now being multiplied in a series of instruments to be placed on the market. In this camera, the mechanical construction of which must be credited to Mr. Newman, two problems have been solved. The first is that of providing a conjunction of diaphragm shutter and mirror according to which the sequence of operations is as follows:—1. Lens open: Picture being focussed. 2. Release: Lens covered whilst mirror rises, then opened and closed to give exposure. 3. Shutter set again by turning mirror into down position. The second problem is to do all the foregoing and yet allow of the camera front being racked in and out and moved up and down as required in ordinary work. Mr. Newman has achieved the first of these ends by using underneath the mirror an opaque flap or screen, which covers the plate while the mirror rises (during which time the shutter aperture is covered), and then itself follows the mirror up, actuating the shutter and making the exposure.

The linking of the mirror mechanism to the shutter is done by an extremely strong yet flexible mechanical link, which allows of a to-and-fro movement of the lens front of $2\frac{1}{2}$ ins. and simultaneously of the lens being given a rise of slightly over 1in. Thus we have in the new "N.S." camera an instrument the bulk of which is only $5\frac{3}{4}$ by $6\frac{3}{4}$ by $7\frac{1}{4}$ ins., which has an extension of 8ins. from lens-diaphragm to plate, and is fitted with a diaphragm shutter of Mr. Newman's design, which is set in an instant to any one of a series of speeds from 1-100 to $\frac{1}{2}$ a second in addition to time.

Though our description of the stages in the making of an exposure may have sounded alarming, yet in practice the manipulation is extremely rapid; a single turn of the outside lever puts down the mirror and a similarly rapid movement sets the shutter. And as regards release, in operation the mirror with its supplementary flap moves as though it consisted of one piece only, exposure of the plate following instantly on pressure of the release.

The makers frankly admit that so far as the present design is concerned they are limited to the $2\frac{1}{2}$ins. to-and-fro movement of the lens front. This, of course, is ample for all ordinary work with a 6-in. lens, the camera allowing of $1\frac{1}{8}$ in. rise with an $f/4{\cdot}5$ anastigmat of this focus. When copying upon a scale not permissible with this lens, one of shorter focal length may be employed, whilst in place of a long-focus lens of the usual type we are now able to draw upon fixed-focus-telephoto lenses, the aperture of which is amply sufficient for a large proportion of hand-camera work. Thus, within the limits imposed by the adoption of the non-focal-plane shutter, the reflex worker has still all his accustomed facilities, whilst the

gain in reliability, range of slow speeds and simplicity of manipulation are highly positive advantages, obtainable only in the new "N S." reflex

In conclusion, it need only be said that the new instrument in neatness of design and excellence of workmanship is all that the long experience and reputation of Mr. Newman in camera construction have led us to expect from him. Like any other reflex of the highest class, the price cannot be low. While that of the "N S" is not precisely fixed at the time of writing it will be close upon £20, inclusive of the *f*/4 5 anastigmat It is not too much to signalise the new camera as the most notable departure in hand camera construction during the past ten years

A NEW HIGH SPEED DIAPHRAGM SHUTTER.

(Made by F Whitehead and Co, Picket s Street Works Balham, London, S.W.)

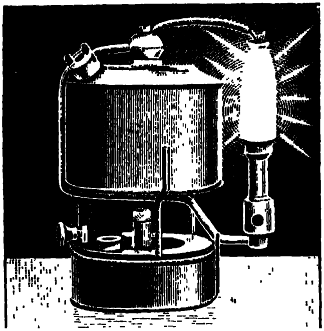
Messrs Whitehead, whose "Pyket" or "Unit" self-capping focal-plane shutter has achieved widespread popularity, send us the first model of a new metal diaphragm shutter of their design in which speeds from about 1/30 of a second to a very short exposure indeed—we should say about 1/500 of a second—are secured by means of a series of spring tensions. The arrangement of the shutter blades is such that the latter move wholly in one direction when giving the exposure, and thus can be made to move at a very high speed. Moreover, the shutter can be provided with the usual time valve, giving exposures from ⅛ to 3 seconds, as also with a pneumatic brake giving a similar range A further very convenient adjustment is that for bulb exposures. A separate release is supplied for this purpose, the lens remaining uncovered as long as the release is kept pressed. This can be done with the shutter set to any speed, so that the worker, at the instant before exposure, can make the instantaneous exposure, or can give one by "bulb" A further feature, which is interesting at the present time, is the special fitness of the shutter for adaptation to the reflex camera. With the shutter set, the action of the mirror can cause first the closing of the open shutter and then, immediately afterwards, the "instantaneous" opening and closing. The shutter is made in size to take lenses up to 1 in aperture—that is to say, with lens tubes up to 1¾ ins diameter. Its construction is one which strongly impresses us as free from liability to derangement, whilst the prices at which it is to be issued are moderate—from £2 2s It is certainly a further step in advance in diaphragm shutters, on which the British makers are to be congratulated.

THE HUGHES SPIRIT MANTLE BURNER.

(Sold by W. C. Hughes and Co., 82, Mortimer Road, Kingsland Road, London, N.

In this new lamp Messrs. Hughes provide the enlarger and lantern worker with a most powerful light produced with methylated spirit only, and of a size to go into any projection or enlarging lantern. The lamp is worked without aid of any pump, the gas being produced by volatilising spirit (in a chamber provided for the pur-

pose by means of a small spirit flame placed beneath it. The height of this flame is adjusted by rack and pinion, and the supply of the combustible vapour thus controlled to a nicety. We have seen for ourselves the remarkable power of the light, which is greatly in



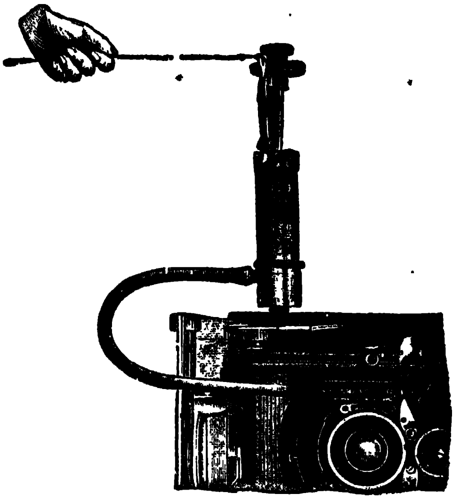
excess of the best oil lamp, and distinctly better than a four-burner acetylene jet, and this not only as regards intensity, but also in colour. Comparative tests have shown us the effective 12 ft. picture which is obtained with the burner, which, once started—it requires only about five minutes to have it in full action—provides a most brilliant light for a couple of hours. The lamp is the most satisfactory illuminant, short of the electric arc or a lime jet, which we have seen. Messrs. Hughes will have it on the market by the time this description reaches the reader, and prices may be obtained from them on application to the above address.

THE "PRIMUS" DISTANCE SHUTTER RELEASE.

Sold by W. Butcher and Sons, Ltd., Camera House, Farringdon Avenue, London.

A handy little accessory for actuating any type of pneumatic-release shutter, when at a distance from the camera, is supplied under this name. As shown in the drawing, it consists of a plunger provided with a spring. The plunger rod is pulled up out of its tube and held by a light metal lever to the end of which is attached a stout thread. The cylinder of the plunger is connected by a rubber tube to the nozzle of the pneumatic shutter. A slight pull on the thread disengages the plunger rod and operates the shutter. The accessory is supplied with a screw by which it can be inserted into the bush of a hand camera, but the makers also send out with it a heavy base which can be stood near to the camera—or upon it, where it is not possible to use a bush. The thread is wound on a reel, mounted in a neat case after the manner of a fishing-rod reel. In this way 24 yards of thread are carried within the space of a circular case measuring 2 ins. in diameter by ½ in. thick. The thread is rapidly re-wound into its case after

use. For the purposes of the nature photographer, the inclusion of the photographer himself in a group or landscape, etc., this is a



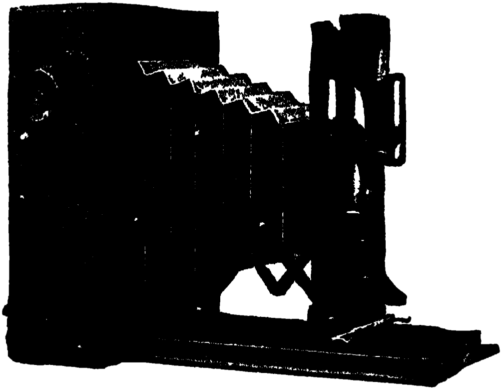
most useful accessory. Most strongly made in nickelled brass, the price is 10s. 6d.

THE "VESTA" FOCAL-PLANE POCKET CAMERA.

(Made by Adams and Co., 24, Charing Cross Road, London, W.C.)

The firm of Adams has again broken all its previous records in the construction of highly-portable hand-cameras by creating a new type of instrument, namely, one of very small dimensions fitted with focal-plane shutter and with all the working parts, including the lens, covered when the camera is closed. This focal-plane "Vesta" is on the lines of the previous "Vesta" models with lens shutter, but is fitted with the Adams "Minex" focal-plane. In the $3\frac{1}{4}$ by $2\frac{1}{4}$ size the camera, when closed, measures under $5\frac{3}{4}$ by 4 by $2\frac{1}{4}$ ins., the only projection being the solid milled head of the shutter and the small tension key. Yet on the camera being opened the front slips out easily into position in focus on any distance from infinity to one yard, the lazy-tongs side-supports giving an extremely rigid front. As in the 1911 model of the "Vesta," focussing is by a neat winch screw, the head of which is placed on the front of the baseboard. Like the 1911 "Vesta," also, the camera has the immense convenience of the Adams's "Identoscope" finder connected with the lens-panel and rising front, so that when the lens is raised, either landscape or upright way of the plate, the alteration in the picture is automatically shown on the finder. The one finder

provides this movement in both positions, and the level, likewise, registers the horizontal holding of the camera both upright and landscape way. Of the "Minex" shutter it is only necessary to say that no further refinement in focal-plane shutters can be



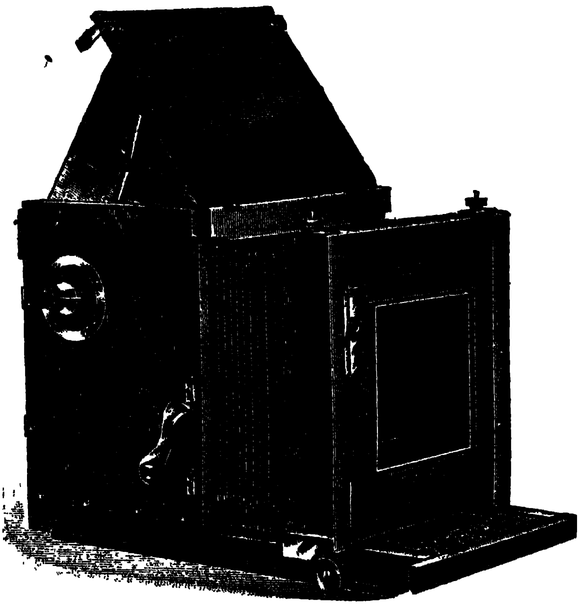
imagined With the shutter set the whole range of instantaneous exposures from $\frac{1}{8}$ to 1-1,000 of a second, in addition to bulb and time, are instantly obtained, and the shutter remains at a given setting until intentionally readjusted, which is done simply by

pulling out the winding key about half-an-inch and re-inserting it in its disc. The Adams's "Vesta" is certainly the smallest focal-plane camera of its movements which has ever come into our hands. In the $3\frac{1}{4}$ by $2\frac{1}{4}$ size its price is £17 17s.; in quarter-plate, £19 19s. These include six double slides, focussing screen, Zeiss *f*/4.5 "Tessar," and a leather case for the slides.

THE "FALLOWFIELD" STUDIO REFLEX.

(Sold by Jonathan Fallowfield, 146, Charing Cross Road, London, W.C.)

The studio "Fallowflex" is built in the whole-plate size, fitted with repeating back for taking two half-plates in quick succession. The focal-plane shutter is of a special very silent type, giving instantaneous speed up to 1-10th of a second, as well as time exposures. The mirror falls automatically after exposure, whilst a second mirror is provided in the open type of hood, so that the camera can be used when necessary at a height which would



render it inconvenient to focus and examine the subject on the horizontal ground-glass. In the matter of extension the camera is well provided, allowing of 24 ins. from front to back, while the lens panel is made of ample size to take the largest portrait lenses and is mounted in a recessed lens-box. The camera is very solidly made and of the handsome finish necessary in a studio instrument. The price, complete with one whole-plate dark-slide and a repeating back, is £12 12s.

THE DALLMEYER DARK-SLIDE "AUTO-CATCHES."

(Made by J. H. Dallmeyer, Ltd., Denzil Road, Neasden, London, N.W.)

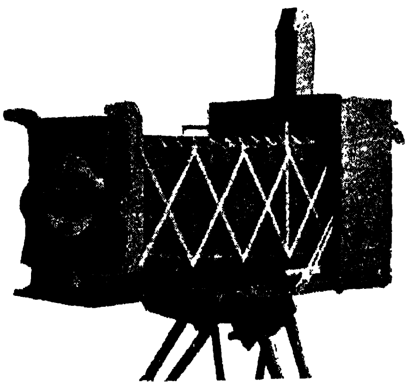
A very ingenious little accessory for dark slides, designed for the purpose of preventing accidental double exposure of a plate, is a

new introduction of Messrs. Dallmeyer's, who are fitting it in future to the dark slides of all their cameras, and are supplying it in sets of six, price 1s. per box. The catch consists of a nickelled spring, which is screwed to the top of the draw-out shutter. Into the top of the dark slide itself a small screw is inserted. The head of this screw engages with a slot cut in the spring. When the dark slides are loaded the shutters are pushed in so that the spring comes between the upright screw and the top of the shutter. On pulling out the shutter the spring is pressed with the fingers nearer to the shutter, and the latter is thus released for the exposure, but on pushing back the shutter in the usual way the spring falls on the other side of the screw, and, if an attempt be now made to draw out the shutter a second time, the catch holds it locked, unless the worker deliberately pushes the spring off the screw, an operation which must be done deliberately and cannot be overlooked. The indicator is the acme of simplicity and has the advantage that if for any reason no exposure is made after once withdrawing the shutter, the operator, by taking care to bring the spring down on the inside of the screw, can leave the dark slide as originally set. In the ordinary way he would not do this, but would simply push the shutter home by pressure on the top only.

THE N. AND G. "TRELLIS" CAMERA.

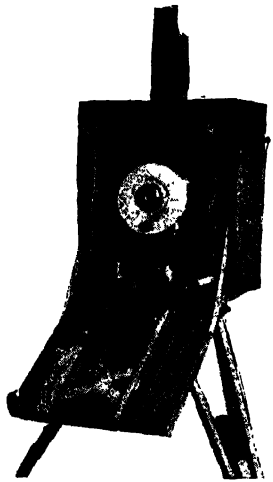
(Made by Newman and Guardia, Ltd., 17 and 18, Rathbone Place, London, W.)

An altogether new model of the famous series of "N. and G." cameras is being introduced in readiness for the 1911 season. It is a camera of the hand-stand pattern, providing the fullest range of movements and suitable for architectural, telephoto, and other



forms of stand work, in addition to the full run of hand-camera photography. The capabilities of the instrument are secured by means of the lazy-tongs or trellis support of the front familiar to users of the "Sibyl." The convenient arrangement for focussing

when the camera is held in the hand are also those used in the "Sibyl." The shutter is the "N. and G." focal-plane attached to a reversing back, which latter is removable in the ordinary way, so that if the user so wishes the camera can be taken out with an ordinary back in place of the somewhat more bulky one carrying the focal-plane shutter, and the exposures made with a shutter or cap on the lens. In opening the camera for work in the hand the pair of clips seen in Fig. 1 are first compressed, and then, on the front being drawn forward, snap into a pair of notches, leaving the lens in the position for focus on infinity. Focussing for nearer objects is then done by moving the lever as in the "Sibyl," the focussing scale being fitted with the useful depth scale. When using the half of the lens the camera is pulled forward again and the front snaps into the second pair of notches, the use of the same



"Sibyl" focussing lever serving for use in this position—all this without touching the milled head which racks the baseboard forward. The latter, for use with the camera on a stand, gives the full extension of the instrument with remarkable rigidity owing to the trellis side-supports. Attached to these latter is a light metal frame, preventing sag of the bellows. Large rise and fall is secured by making the lens-panel just large enough for the flange and providing a pleated leather connection above and below, thus allowing for the maximum rise and fall. There is also a swing-front movement conveniently arranged on the light metal struts of the front. A good word must be said, too, for the ready detachment of the bellows from the front to allow for the use of, say, a light-filter behind the lens or for the insertion of a telephoto attachment.

While thus eminently fitted by its construction for long focus

work, the camera has special movements for the use of wide-angle lenses. The front, instead of being drawn forward to the runners mounted on the projecting baseboard, remains in the back body, a supplementary rack and pinion serving for focussing in this position, and the baseboard dropping so as to avoid cut-off. In this wide-angle position it should be noted that the rise-and-fall movement of the small lens panel is equally effective. The finder is also of special construction, being of the ground-glass pattern mounted in a tower pattern of box, which is fitted with a magnifier and hood at the upper end. The picture thus obtained is both large and brilliant, yet does not vary with the position of the observer's eye. The finder is also hinged so that it can be tilted in accordance with a graduation of the rising front, whilst the whole accessory turns down into the back body of the camera entirely out of the way.

The shutter, while of the general pattern of the 1911 "N. and G." focal-plane, is provided with a quick wind about two and a-half turns; the release lever occupies a position by the side of the bellows, the slightest touch serving to make the exposure with extreme smoothness. It is fitted with a special movement for bulb exposures, which are made simply by turning over a lever on the outside of the camera when winding the shutter. The building of the shutter provides the means of using dark-slides, changing boxes, etc., exactly as in the "N. and G." reflex; whilst the last good point of this truly universal and portable camera is the entire freedom from projections when the apparatus is closed for carrying. At the time of writing prices for the various sizes are not yet fixed upon, but those interested in the new instrument should communicate with Messrs. Newman and Guardia.

THE "MULTI-SPEED" DIAPHRAGM SHUTTER.

(Sold by Ross, Ltd., 3, North Side, Clapham Common, London, S.W.)

This new diaphragm shutter, which is issued from Messrs. Ross' factory under the patents of the American inventor, marks a notable step forward in shutter construction. To describe its features in a word, it gives a greater range of speeds, from high to low, than the focal-plane shutter by means of mechanical construction which is very strong and free from liability to derangement. Its introduction comes appropriately at a time when the focal-plane shutter shows signs of decreasing popularity owing to the difficulty of securing such useful low speeds as $\frac{1}{4}$ to $\frac{1}{8}$ of a second, and to the fact also that by its very form it is more liable to get out of order than shutters of the diaphragm type. Moreover, it has been realised that the exaggerated claims made for the focal-plane as regards efficiency are scarcely justified in practice. For the 100 per cent. efficiency with which the focal-plane is commonly credited by writers the moving blind should be in contact with the plate, whereas it is frequently from $\frac{3}{8}$ to $\frac{1}{2}$ inch away. Thus, on the ground of convenience, ability to keep in working order, freedom from dust, etc., the diaphragm shutter is unquestionably greatly superior to the focal-plane, though the latter type does conduce to a very

compact form of camera, such as the deservedly popular folding instrument in which the unprotected camera-front is rigidly held in front of the plate by two or more struts, a pattern which originated in the Goerz "Anschutz," and is now issued by practically every maker.

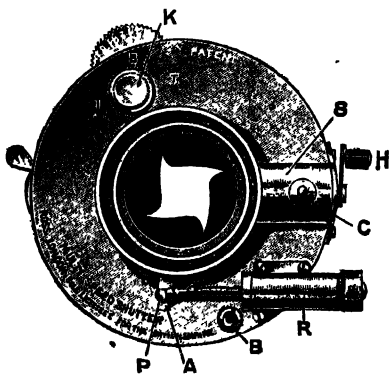
The model of the "Multi-Speed" which we have had for some time for trial is the larger of the two being placed upon the market, and is suitable for lenses up to 1¾ in. diameter. The smaller size of shutter takes lenses up to 1⅜ in. As seen in the drawing, the shutter consists of a pair of discs, which in the instrument before us have a diameter of 4 ins., so that the size over all, inclusive of the projections, is under 5 ins. The essential feature of the construction is that the exposing blades of the shutter are each pivoted on an axis midway along the length of each, and the operation of the shutter consists, not in a back-and-forward movement of the blades, but in a single rotating movement of each blade, so that the aperture at the end of the exposure is covered by the four halves of the blades, which at the commencement of exposure were contained in the rim surrounding the lens aperture. It is this single half-revolution movement which allows of a very rapid exposure being given, so that the time of opening and closing is necessarily extremely short in reference to the total period of exposure. The shutter is constructed not only for extremely rapid work, but also for time and bulb exposures.

In manipulation it is necessarily somewhat more complicated than the diaphragm shutters at present issued, which represent a degree of reduction to simplicity which is attained perhaps by no other similar type of mechanism. In the "Multi-Speed," however, we get more, and, therefore, we have to pay for it in the necessity for somewhat more trouble in setting the shutter. Setting is done by turning the handle seen on the right of the drawing. This handle must be turned the right way, which is the way needed to cause the arm A to begin to advance along its slot. If the handle be turned in the opposite direction the arm A retreats slightly towards the end of its slot, and if the shutter be set by winding in this way no exposure results when the release is pressed. This is the first thing to learn. The next is the extent to wind for a given exposure. When the handle is wound the back disc of the shutter is rotated. This back disc is marked with a series of numbers in the following order :—20, 15, 10, 8, 6, 4, 2, 2, 4, 6, 8, 10, 15, engraved on the edge of the disc. The fixed or front disc of the shutter (that seen in the drawing) has engraved on its edge the letters A, B, C, D. The method of setting the shutter is as follows :—The handle S is given a slight turn, first one way and then the other, and then allowed to rest for an instant, it being then noted where one of the figures 2 comes on the A, B, C, D scale. On the handle being further turned, the other figures on the back disc are brought to this point (which will be at A, B, C, D, or at some intermediate point readily recognised by the eye). On winding 2 (the other 2) to this point the exposure is 1-200th of a second, 4 1-400th, 6 1-600th, and so on. This method holds good whichever way the winding key requires to

be turned; the only difference is that one 2 or the other is taken as the starting-point.

For repeating the same exposure there are two methods. The first is to release the winding handle by pushing along the knob S and re-winding the handle in the opposite direction. This is the standard method, and it has the advantage that it does not uncover the lens. The other method consists in leaving the winding handle at its tension, pressing the release a second time, and pushing the arm A from the end of the slot, to which it has come back, to its starting point. This uncovers the lens, which must, therefore, be capped during the operation, and the method is not advisable for the very highest speeds.

For slower exposures the brake R is brought into operation by attaching the piston to the arm A at X. Using this brake at the maximum (controlled by the milled head of the valve seen at the extreme right hand of the brake cylinder), the exposures obtained are actually marked in fractions of a second on the edge of the back disc, the method of setting being precisely the same as for the fastest exposures already described. Here again re-exposures of the same speed are very readily made by pressing down the release and pushing the arm back to its starting-point, covering the lens when so doing. The only other movement is the milled head K, the arrow on which is turned to the points I, B, or T, according as instantaneous, bulb, or time exposures are required.



Without making exaggerated claims for the shutter, we are able to say that the fastest exposures given by it are capable of securing sharp pictures of moving objects which would be, we believe, beyond the power even of a focal-plane, and are superior to the results with the latter, inasmuch as there can be no distortion of the object due to the movement of the image with or against the moving slit of the focal-plane shutter. This has been well evident from a photograph of a motor-car taken at a high rate of speed and moving

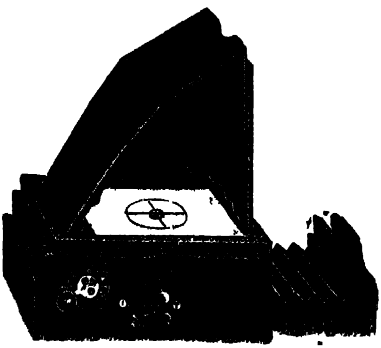
directly across the axis of the lens. Shutter-speed marking, more than anything else in photography, is capable of prompting the scepticism of a reviewer, but the proof of the pudding is in the eating, and the results obtained with the "Multi-Speed" shutter indisputably prove the ability of the latter to deal with the most rapid forms of movement. The fact that it is equally capable for use at quite slow exposures, and practically as convenient in use as other shutters which give these exposures, will indicate that it is an instrument for all descriptions of photography, and one which the Press photographer in particular will not be slow to appreciate. We would add that as supplied by Messrs. Ross it is most excellently made, and its mechanical features give good ground for the belief that it is free from liability to derangement by long-continued use.

The "Multi-Speed" is supplied in two sizes, the smaller at £5 5s, the larger at £5 15s, in each case including "Antinous" release. As a guide to the size of lens which can be accommodated by the two patterns it may be said that the smaller will take $f/8$ lenses of 5, 6, or 7 inches focus, and $f/5.6$ to $f/6.8$ lenses of 5 or 6 inches focal length. The larger size will take $f/8$ lenses up to 10 inches focus, $f/6.3$ or $f/6.8$ lenses up to 8½ inches, and $f/5.6$ objectives up to 7 inches focal length.

A MERCURY LEVEL FOR REFLEX CAMERAS.

(Sold by Taylor, Taylor, and Hobson, Limited, Stoughton Street, Leicester.)

This level is of very simple design, and decidedly simple in use. It consists merely of a watch glass cemented at the edges under the centre of the ground glass, and containing a globule of mercury.



Two lines on the ground glass mark the centre, and in focussing we need only to bring the mercury globule to the centre to ensure a correct level. The price of focussing screen and level together is 4s.

THE "SOHO" SCIENCE LANTERN.

(Sold by Marion and Co., Limited 22 and 23, Soho Square, London, W.)

In this apparatus the makers have provided for the most varied

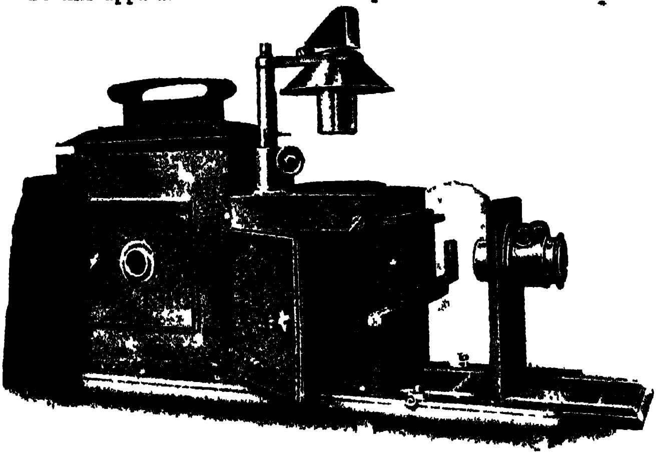


Fig. 1

requirements, not only of the lantern exhibitor, but of the science lecturer, demonstrator, and private experimenter. The one instru-

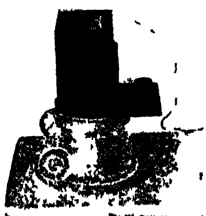


Fig. 2.

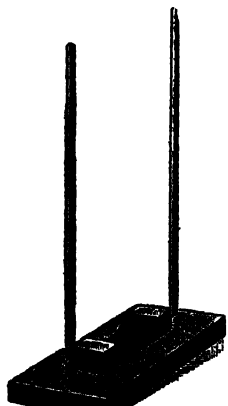


Fig. 3.

Fig. 4.

ment, in conjunction with one or two accessories, permits of ordinary

projection of slides and also of experiments placed vertically between the condenser and the projection lens. It also provides the means of projecting objects lying horizontally, such as plain glass plates, which may be written on and thus provide a substitute for the blackboard. Further, it allows of the projection on a moderate scale of solid objects or originals. The general construction is seen in the figure. For ordinary projection the mirror seen within the box through the half-open door (Fig. 1) is turned out of the way and the slides brought into position by means of the usual type of carrier. When projecting experiments, the lens is

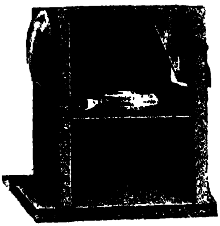


Fig 5.

Fig 6.

fitted with the erecting prism attachment seen in Fig. 2, the slide carrier being removed, and a table (Fig. 3) inserted in the space behind the projection lens in order to carry such small instruments as electroscopes, etc. This table is either placed on its base in the position of Fig. 3, or the other way up, when it is necessary to suspend apparatus. For use with it, a clamp (Fig. 4) serves to hold chemical or electrical apparatus which is being shown on the screen.

In the case of projecting horizontal transparencies the mirror is turned down, as shown in Fig. 1, the supplementary projection lens and prism, mounted on the vertical pillar, then coming into operation. The change from one system to the other is thus made extremely quickly. For projecting opaque objects up to about 2½ inches diameter the attachment, shown in Fig. 5, is placed in the box occupied by the mirror, which latter is turned vertically out of the way. The mirror of the accessory is angled so as to direct the beam of light on the object, the upper projection system of lens and prism then coming into use. For use on a small scale this attachment is a convenient one for the experimenter.

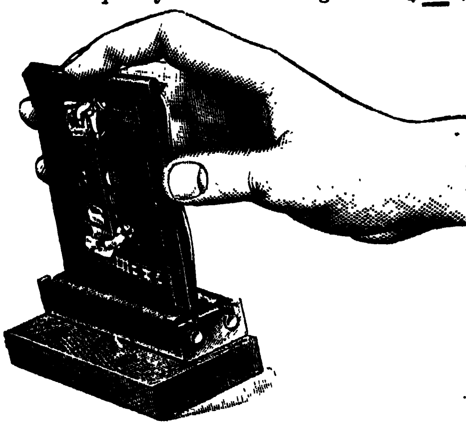
A further accessory (Fig. 6) is provided for spectrum experiments and consists of a slit which is fixed in place of the slide-carrier, and can be adjusted in width. The experimental prism is mounted between mahogany discs held together by metal rods, the frame

on which it is supported being clamped to the baseboard of the lantern, as shown in Fig. 6. The whole apparatus is of excellent workmanship, and provides the means of using any of the ordinary illuminants, such as lime jet and the various forms of arc lamp. The price, complete with 4¼-inch condenser, hinged mirror, ordinary projection lens and vertical projector fitted with prism, slide carrier and curtain is £12. The prices of accessories are as follows: —Travelling case, £1 2s.; allowance for injector jet (Fig. 8) when not required, but not sold separately, 10s.; front erecting prism, £1 5s.; reversible table, 10s.; adjustable clamp, 3s.; slit and prism, £1 11s. 6d.; lantern microscope, £5; opaque projection, £1.

THE 'SPECIALIST" LANTERN-SLIDE BINDING MACHINE.

(Sold by Ernest Bickersteth Fry, 4 and 6, Victoria Avenue, Shipley, Yorks.)

This is a little appliance which we venture to think will be received by lantern-slide makers as an absolute boon to lighten the tedious work of binding. It consists of a pair of metal cylinders, rubber-covered and mounted in a rigid brass frame. In using it the ordinary lantern-slide binder—which, by the way, should be of proper adhesive quality—is used in lengths of 3¼ ins., or, rather,



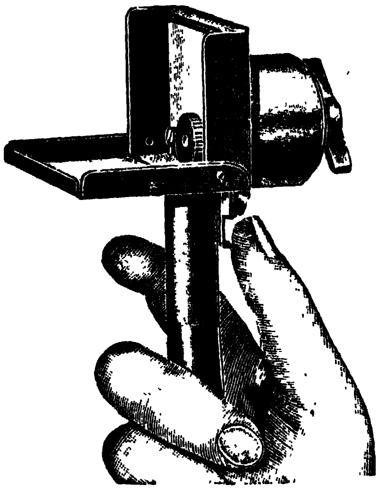
a shade under this. These strips are moistened and laid sticky side up on a sheet of blotting-paper and the slide and cover-glass together simply pressed down on the gummed strip. The two glasses are then simply pressed between the pair of rollers which apply the side portions of the strip with perfect evenness through the glass. Each 3¼-strip is taken on to the slide and stuck down in this way in turn, the whole process being far speedier in action than in description, while the neatness of the binding produced in this way is much superior to that when using the fingers. Those who prefer it may apply a full-length binder to the slide by wetting

it in the usual manner, laying it round the slide and pressing each edge in succession between the rubber rollers as far as it will go. When using the full-length binders it will be noticed that the loose binder is pressed outwards on the vertical edges just at the corner, and a touch of the finger, to bring it back square with the slide edge, is necessary before inserting the next slide into the rollers. The binding machine sells at the retail price of 4s.

THE "AGFA" IMPROVED FLASH-LAMP.

(Sold by Chas. Zimmermann and Co., Limited, 9 and 10, St. Mary-at-Hill, London.)

A quite novel device, which will assuredly be welcomed by every user of flashlight, is the feature of this new lamp. It concerns



simply the ignition of the powder, an operation which, as every flashlight worker knows, is the most uncertain part of the process; ignition methods depending on electrical and other means, while they have met with a greater or less degree of success, have not proved infallible methods of lighting the powder. In this "Agfa" lamp the makers revert to the ancient device of the flint and steel, except that they use for securing the spark a special pyrophorous or spark-giving metal made in the form of a milled disc (seen in the drawing), which, by means of a spring, is caused to rotate against a similar metal surface and thus gives a small stream of sparks whilst it rotates. The powder is spread on the tray around this ignition wheel, and, the key of the mechanism having been wound, simple pressure on the release ignites the powder. We have found the method unfailing in its action, and the certainty which

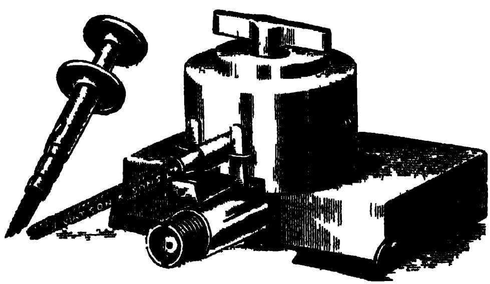
it gives for flashlight work under difficult circumstances should prove a boon to those who have occasion to undertake this branch of photography. The lamp is made in two patterns, the hand

model fitted with finger release, price 4s 9d The hand stand model, with pneumatic release price 6s 9d Refills of the sparking metal disc are sold at 8d. each, each disc being sufficient for igniting the powder for several hundreds of exposures.

THE "ANTINOUS" FLASH LAMP RELEASE

(Made by W Watson and Sons, Limited, 313, High Holborn, London, W C)

Specially for use with the "Agfa" flash lamp noticed above Messrs Watson issue the well known "Antinous" non rubber release in lengths from 2 to 6 ft The advantage of a release which

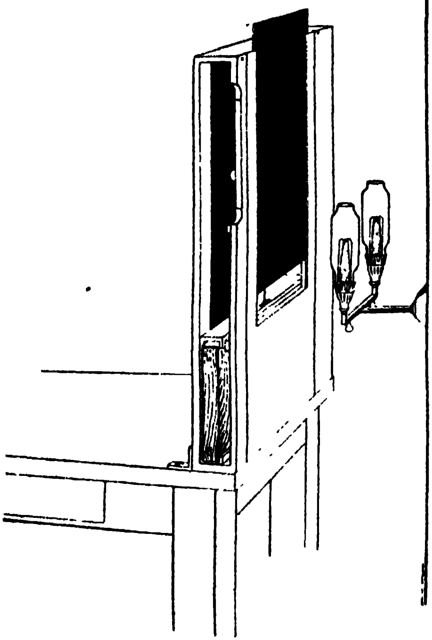


is not liable to damage by accidental contact with the flash should be sufficiently obvious, and many users of the efficient "Agfa" lamp will be glad to have this accessory to it

THE "GRAVITY" PRINTER.

(Made by Kodak, Limited, 57-61, Clerkenwell Road, London, E.C.)

This is a quite new departure in time-saving apparatus for printers. It is devised for bromide and gaslight work, and allows the printer to adjust matters so that, without clock or watch, he can give a series of exposures one after the other, and all identical as regards time. This is done by means of a carrier, which holds the printing frame. The carrier is suspended by a cord, which passes over a pulley, a weight at the other end of the cord serving to raise the carrier quickly when relieved of the weight of the printing frame. On the printing frame being inserted in the carrier, the weight causes it to fall slowly in the guides shown in the drawing, a fan attached to the pulley acting as a brake. In front of the frame is a black shutter, the height of which can be adjusted so that the printing frame in its movement downwards can pass behind a broad or a narrow slit, according to the setting of the shutter. Though its speed is always the same, yet this adjustment



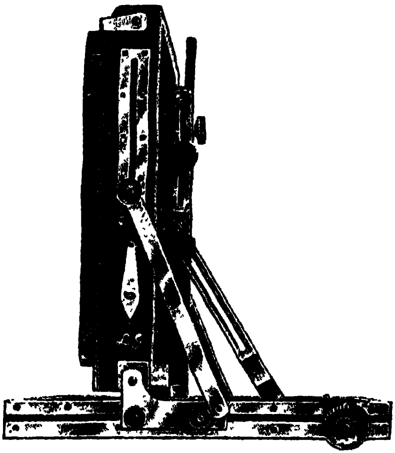
allows of the following series of exposures :—$\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, $1\frac{3}{4}$, 2, 3, 4, 5, 6, and 7 seconds. The apparatus is instantly set for any one of these, simply by pushing a pointer affixed to the shutter into the proper notch. As made, it takes a printing frame up to 7 x 5 inches.

THE "NEW IMPERIAL" STAND CAMERA.

(Made by L. Gandolfi, 752, Old Kent Road, London, S.E.)

In this new model of stand camera Mr. Gandolfi has applied his long experience as a camera maker to producing an instrument which responds to the most exacting demands of the photographer, par-

ticularly in the use of very short focus lenses, coupled with the employment of a rising front. As many workers have no doubt realised, it is by no means easy with many patterns of camera (even those of many movements) to use a short-focus lens and at the same time be able to raise it when including tall buildings. In the



raised position it will often be found that the bellows intercept a clear view of the plate, with the result that, for practical purposes, the rising front movement, so far as a wide-angle lens is concerned, is non-existent. In the "New Imperial" of half-plate size the plate can be placed 2¼ ins. from the surface of the lens panel, surely a short enough distance for any lens intended to cover a half-plate, and in this position a full rise of 1 in. is obtained and a fall of ¾ in. This is secured by the ample movement of the lens panel itself and without the slightest cut-off from the bellows. The back body of the camera is built a little larger to allow of this being done, but, even so, its outside dimensions are but 8 × 8¼ ins. The illustration shows the camera in this position, the close approach of back and front being obtained first by sliding the back forward in the customary way and, secondly, by providing a hinder or midway support for the complete lens front.

In the normal position the camera allows a rise of 2¾ ins., the whole front sliding most smoothly in brass bearings, which make a rack and pinion adjustment quite unnecessary. At the highest point the position of the lens front is most rigid. The total extension is 15⅝ ins., whilst the camera measures when closed 2½ ins. Its weight is 4 lbs. We strongly approve the maker's policy in producing an instrument in which everything has not been sacrificed to

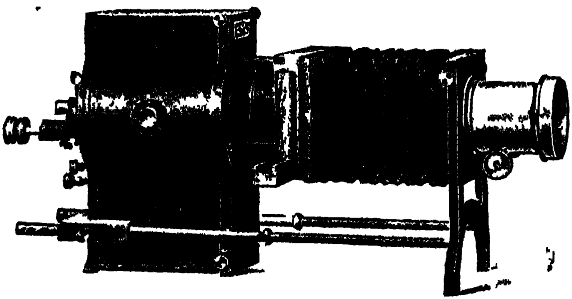
lightness. The "New Imperial" is most strongly made, yet it is little above the normal weight. It has all the movements, such as swing and reversing back, which a camera can require, and these in a style of cabinet making which will withstand hard wear and a trying climate In the half-plate size, with three double slides, the price is £5 10s Extra for brass binding, 23s. In whole-plate these prices are £7 and 29s.

"BALOPTICON" LANTERNS FOR ORDINARY AND OPAQUE PROJECTION.

(Made by Bausch and Lomb Optical Company, 19, Thavies Inn, Holborn Circus, London, E C)

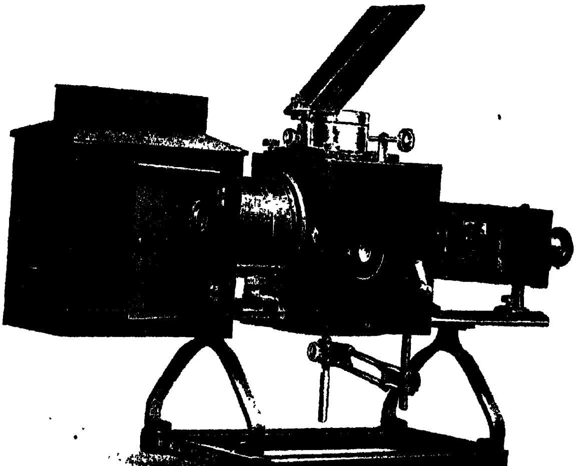
A whole series of most efficient and well-designed lanterns have been placed on the market by the Bausch and Lomb Company at very moderate prices The instruments range from the Model C, suitable for both home and public use for ordinary slides, up to the Convertible "Balopticon," which is a most complete equipment for ordinary transparencies, opaque originals, and horizontal subjects, such as chemical experiments, etc

To describe the Model C first, its simple construction is well seen in the drawing. The lantern body is of specially small size,



but its shape allows of any standard pattern of illuminant being used, arc or incandescent electric, limelight, acetylene, or a spirit mantle burner The top of the lantern is closed by a sunk grating like cover, which forms a perfectly efficient light trap, yet by its construction avoids over-heating The lamp is mounted on a bracket, which rests loosely on the pair of main runners, being held at any point by the set screw seen to the left of the drawing In the case of the arc a most simple adjustment allows of its being raised and lowered and turned from side to side. Centreing is thus very certainly and quickly done The lantern front runs out on a pair of tubes, which slide within the main runners, and are likewise fixed by their set-screws. The extension from slide carrier to lens panel is 12 inches. The condenser simply sits on a carrier, being held in place by a flexible band and buckle, which retain

it in position without subjecting it to any strain. The special mounting of the lenses in the condenser cell provides very free ventilation, and does all that is possible to safeguard the glasses from cracking. The bellows, which is the only non-metal part of the lantern, is attached at each end to metal frames sliding in metal grooves, and is instantly removable. The flange of the



projection lens is secured to the lantern front by a form of bayonet catch, so that when necessary one objective can be very quickly exchanged for another. The total weight of the lantern is 16 lbs., or 20 lbs. with the carrying case, which latter is made with a wooden cover, serving as a baseboard for the lantern, and allowing of it being readily tilted when in use. An idea of the compactness of the instrument will be obtained from the total outside measurements of the case, which are 24½ by 11½ by 8 ins. With 100 candle-power incandescent electric lamp the price of the complete outfit is £5 17s. 6d., with arc lamp £6 12s. 6d. The definition given by the projection lens is exceedingly crisp, and the whole outfit, from its simple and substantial build, is one to withstand an immense amount of hard wear.

For use with the C "Balopticon" an attachment is supplied for the projection of opaque objects at prices from £6 5s. to £10 10s., whilst a further more elaborate attachment provides for the projection both of opaque originals and of transparencies, experiments, etc., laid horizontally. The prices in this case are £15 to £24 11s. 3d.

In the Convertible "Balopticon" similar methods of mounting, etc., are adopted, the one instrument in this case providing in a most convenient way for ordinary projection, projection of opaque objects as well as those in a horizontal stage. The convenient arrangement of the mirrors and the rapidity with which one form of projection can be substituted for another are features of this instrument, which fit it for use in public institutions, or for the most exacting requirements of private exhibitors. The price of the outfit is from £37 10s.

THE "COSWAY" ENLARGER.

(Made by Gold, Smith, and Co., 44, Chapel Street, Salford, Manchester.)

Although, strictly speaking, this apparatus is an enlarger, the essential part of it is a device for printing a border round the postcard portrait at the same time that the portrait itself is printed on the postcard. This is very ingeniously done by taking the negative in the first instance through an opaque mask, so that there is a

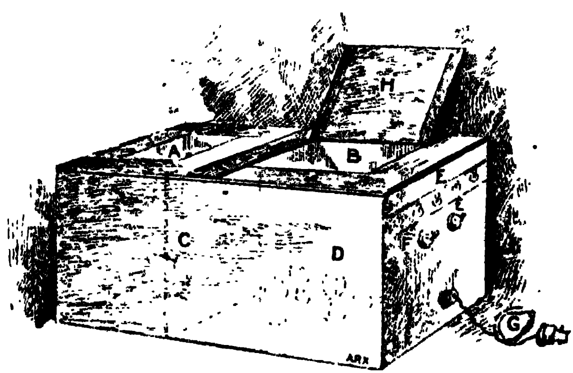
clear margin all round the portrait. This negative, on being placed in the stage of the projection apparatus (which is built vertically), casts its image on the postcard placed below, immediately below a frame containing the border negative, the central portion of which is left quite clear. As a result, the portrait falls on the sensitive paper through the clear central opening, whilst the light, coming from round the margins of the portrait, at the same time prints the decorative border. This operation is further facilitated by the arrangement of the border negative in a spring frame, it being only

necessary to feed in the cards film up against the series of stops, and to press down the frame of the border negative. This uncovers the lens, and exposure goes on until pressure is released. The apparatus by which this is done is very strongly made, incandescent gas is used as the illuminant, and the whole outfit complete, with lens and condenser for working from negatives 3 3-16 x 2¼, is £6 6s. We know of no other piece of apparatus which secures this end, or is operated with such ease and rapidity. It will be understood that this apparatus is specially valuable in producing a portrait postcard, with a border, not only at a lesser cost, since a small plate is used, but also in the minimum of time, since the negative simply requires to be given a bath of formaline after the hypo, and can then be placed direct in the enlarger. The apparatus is equally suitable for thus rapidly taking off portraits of full postcard size from such small negatives, and the makers estimate that in the first £8 worth of plates used the cost of the apparatus itself is saved. The apparatus allows of rapid "while-you-wait" photography, six postcards being producible within ten minutes of the plate being exposed. The idea of making the light coming from the projecting lens serve the double purpose of printing a negative as well as impressing the projected image is certainly a most ingenious one, and capable, we can see, of still further applications.

THE "ARX" ELECTRIC BROMIDE PRINTER.

(Sold by F. E. Jones and Co., 22, Gray's Inn Road, London, W.C.)

This piece of apparatus is introduced for the special purposes, not of those requiring to take off bromide prints in large numbers



from a single negative, but of those who are constantly taking a few bromide prints from a miscellaneous number of negatives. The apparatus is designed to facilitate the correct exposure of the prints at the first trial, the method upon which it is based being as

follows :—The printer is divided into two parts by an opaque partition. Division A contains a single electric lamp; division B, a battery of six lamps. The photographer provides himself with a negative as thin as any which he will be printing, and this he places in the carrier A. Here, illuminated by the one lamp, it serves as a standard by which to judge the exposure required for denser negatives. These latter, as they require to be printed, are laid upon the carrier in the B division, and one, two, or more lamps switched on until the negative in B becomes as bright to the eye as A. The exposure for a given brand of paper having been found once for all for A, the same time is given to each negative after the illumination has been adjusted under the second negative, as just described. The apparatus is solidly made in fumed polished oak, its outside dimensions being 24 x 12 x 12 ins. It accommodates negatives up to whole-plate size, and, complete with lamp-brackets, switch, connecting plug, and brass tilting rods, costs £2 15s.

THE "MONOCULAR" DETECTIVE CAMERA.

(Sold by W. Watson and Sons, Limited, 313, High Holborn, London, W.C., and by the Westminster Photographic Exchange, Ltd., 119, Victoria Street, London, S.W.)

This is a camera of special pattern taking $4\frac{1}{2} \times 6$ cm. plates, in single metal dark-slides. Strictly speaking the novelty of the apparatus lies, not in the camera, but in the finder. The whole instrument is built in imitation of a monocular, the "lens" of which

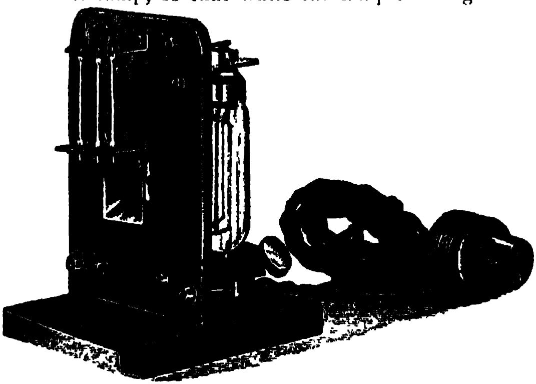
forms the finder, whilst the body constitutes the camera proper. The finder is fitted with a right-angle prism, so that when holding the monocular directly pointing in a given direction the picture seen (and photographed on the plate) is that of the subject lying to the immediate right or left according to the position in which the camera is held. Thus, figure studies and similar attractive subjects for the hand-camera can be secured at the closest quarters without arousing any curiosity or stiffness of pose. For use in the ordinary way a second direct-vision finder of the usual type can be

affixed to the camera body, and this is the most convenient arrangement when taking ordinary views. The shutter is provided with three speeds, and provision for focussing is made by having the back, which takes the focussing screen or metal dark-slide, fitted with a pair of half-attached metal frames which allow of the image being formed and cast on the plate at distances corresponding to the focus for infinity, 8 yards and 1 yard. Complete with detachable finder, two focussing screens, twelve metal dark-slides, "Cooke" lens f/6·5, and substantial leather sling case to hold the complete outfit, the price is £8; with Zeiss "Tessar" lens f/4·5, £11.

"RADAX" ELECTRIC ENLARGING LAMPS.

(Sold by G. T. Collis, 57, Hatton Garden, London, E.C.)

A series of new lamps, using the Nernst filament, are made under this name in patterns possessing a number of specially good features and providing a most convenient source of light for enlarging or lantern projection upon a moderate scale. In all the lamps the resistances are placed vertically, thus ensuring a much longer lease of life, since the thin wires of the resistance are not liable to sag in this position. Also the resistances are placed conveniently at the back of the lamp, so that while the lamp is being actually used



one or more can be moved in order to reduce the strength of the light. In place of the magnetic cut-out usually used in Nernst self-lighting lamps, a switch, operated by the user, is employed. It is turned off as soon as the lamps light up, thus giving a greatly increased term of life to the burners. Radax lamps can be adapted to any voltage by merely changing the filaments or burners, and are fitted with a flexible wire and adapter to fit any ordinary household lamp-holder. In the A pattern "Radax" lamp, filaments for various voltages are interchangeable. These lamps require the filaments to be heated when lighting up. In those of the B pattern the burner is self-lighting, the current being cut off

from the heating coil as soon as the filament lights up. A very good example of the A pattern is the No. 1, a three-filament lamp for any voltage, high or low, and giving about 1,000 candle power on a 200-volt current at a consumption of three-fifths of a unit per hour. Complete with heater, flexible wire and plug ready for connection with an ordinary electric light fitting, the price of this lamp is £1 16s. The No. 2 for two filaments is supplied at £1 11s. 6d.

Among the B pattern an excellent little lamp for the purposes of the amateur enlarger or lanternist is the No. 3, made for voltages of 200 and upwards, and giving a candle power of about 300, with a consumption of 1/50th unit per hour. The price of this lamp is £1 5s.

In each case the lamps are mounted on a tray suitable for any lantern or enlarger, and fitted with upright pin and adjusting bracket for centreing purposes. Exact adjustment of the lamp in the lantern is of less importance in the case of these filament burners in consequence of the greater area of the light, and for general convenience, regular working without need of any adjustment whatever once the lamp has been started, no more convenient illuminant can be desired.

For those wishing to choose a lamp specially with regard for their own requirements, the following table from the vendor's circular will enable a suitable selection to be made.

No	Class.	Details.	Candle Power. On 200 Vlts.	Candle Power. On 100 Vlts	Ampères.	Price Complete
1	A	3 Filaments, any Voltage	1,000	500	3	£1 16 0
2	A	2 Filaments, any Voltage	700	350	2	1 11 6
3	B	1 Filament, high Voltages	300	--	1	1 5 0
4	B	2 Filaments, low Voltage	—	300	2	1 5 0
5	B	3 Filaments, any Voltage	1 000	500	3	2 2 0
6	A	5 Filaments, any Voltage	1,600	800	5	2 5 0
6A	A	5 Filaments, any Voltage	2,000	1,000	7	2 10 0
7	B	4-3 Filament burners, any Voltage........	4,000	2,000	12	20 0 0

Spare filaments for any lamp in Class A, 2/ each. Spare resistances, 2/- each. Burners for No. 3, 3/6; No. 4, 5/-; No. 5, 15/-.

THE "NORTHLIGHT" PRINTING LAMP.

(Sold by Marion and Co., Limited, 22 and 23, Soho Square, London, W.)

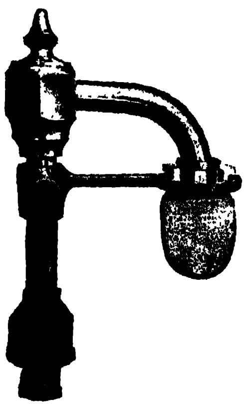
Messrs. Marion and Co., whose persistent advocacy of the system of using arc light by reflection instead of direct through diffusing screens has been endorsed by numbers of the highest class of studios, have now applied the same principle—that of the "Northlight" portrait lamp—to printing, and, as we had an opportunity of witnessing in their studios, have produced an installation which is perfectly simple and reliable in use, and at the same time allows

of results being obtained in the silver, platinotype, and carbon processes equal to those made under the best daylight conditions. The principle of the method consists in the use of the light from two, three, or four arcs, solely by reflection from a white surfaced screen. The 3-arc lamp which we inspected gave a remarkably even and powerful illumination over a circle about 6 ft. diameter. It thus allows of a large number of frames being exposed at a time, the exposure for platinum prints from a good negative averaging about twelve minutes. The lamp can be supplied either for hand or automatic feed, the construction in either case safeguarding the negatives from the falling of particles from the carbons, whilst the printer can work in comfort, spreading his frames in the ordinary way on a table, and examining the prints in the semi-obscurity above the level of the reflecting shade. The constancy of the light, it should also be said, makes it easy to do printing largely by time alone, thus ensuring much greater uniformity in the results. Artificial light for printing being now almost as great a necessity in the high-class portrait establishment as the same source of light in the studio, it is worth mentioning that Messrs. Marion are prepared to convert enclosed arc lamps to work on the "Northlight" principle. The 3-arc lamp, as illustrated, complete for use, is sold at the price of £10 10s.

INVERTED INCANDESCENT BURNERS FOR ENLARGING AND STUDIO PORTRAITURE.

Made by "Howellite" Burners, Limited, 22, Farringdon Avenue, London, E.C.)

This new pattern of inverted mantle burner, now being extensively adopted in domestic and outdoor gas lighting, has several



special features to recommend it for photographic purposes. The principle of the burner, it should first be said, is different from that of the usual type. Though of the inverted pattern, the burner

screws on to any upright fitting. No gauze is used in the burner; the gas enters through a nipple, passes up the main tube and thence to the combustion outlet. Without entering into the technicalities of this construction it may be said that it allows of the burner being turned down to the blue without the gas lighting back, whilst the absence of gauze leaves very little opportunity for dust to collect, and all that is necessary for occasional cleaning is to blow smartly through the tube.

The two "Howellite" burners for use in enlarging lanterns are the H 1½, price 3s. 9d., and the H 3, price 4s. 3d. We have found in actual practice that the burners give an exceedingly concentrated and brilliant light, the small area of the illuminating surface allowing of excellent work being produced in the enlarging lantern. The mantles used are a special form of the "Plaissetty" flexible type, which provides an incandescent surface clinging to the burner flame and utilising to the full the gas consumed. The structure of the mantle is practically invisible; no signs of it were apparent on the enlarging easel.

A battery of the "Howellite" burners, to the number of eight or twelve, supplies a most intense, yet fairly diffused, light, sufficiently powerful for studio portraiture. The "Howellite" Company do not supply the complete installation, but the burners are readily fitted for portraiture purposes. Like some other forms of incandescent burner, the "Howellite" can be fitted with the pneumatic distance gas lighter, whereby the light may be switched on and off in the way customary with electric lamps. In place of a bye-pass the company fits the burners with a sliding valve lever, which instantly cuts down the gas supply, leaving the burner at the blue. The burners are most solidly made in brass, and represent a maximum efficiency in the use of coal gas.

THE "RADIOPHOTE" RAPID BROMIDE PRINTER.

(Sold by the Lumière N.A. Co., 89, Great Russell Street, London, W.C.)

The "Radiophote" is an apparatus for use in the dark-room by which exposures on bromide paper may be given very rapidly at

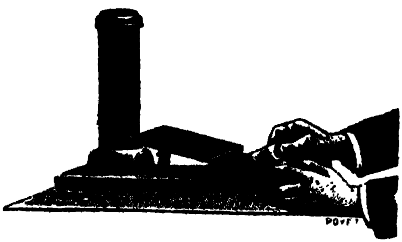


Fig. 1.

a fixed distance from the source of light, which is an incandescent gas burner. This latter is contained in the sheet-iron chimney seen to the left of the drawing. The printing frame is hinged to the other

end of the board, and in the position shown in Fig. 1 is illuminated by the ruby light from the window in the lamp. On the frame being closed and raised into the vertical position (Fig. 2), simply by moving the handle on the pressure-back, the ruby window is auto-

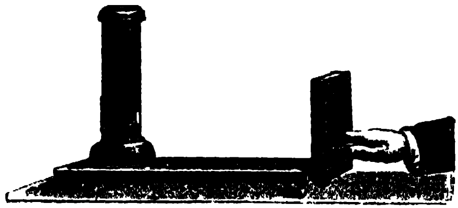


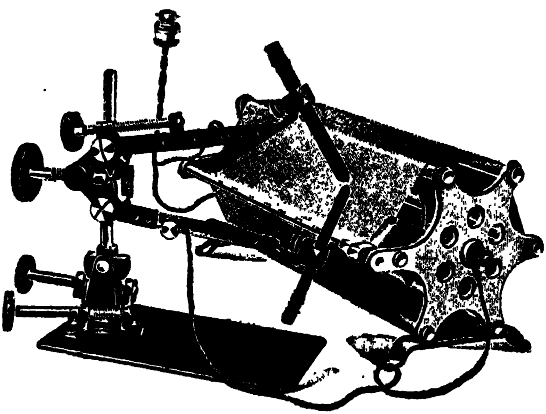
Fig. 2.

matically thrown back and exposure continues until the frame is again depressed, when the ruby screen returns to its position. The apparatus is made for negatives up to 7 × 5 ins., and occupies a bench space of 20 × 9½ ins. It can be supplied with electric or oil light as an alternative to gas. Price 30s.

THE "ARIEL" ARC LAMP.

(Sold by W. Butcher and Sons, Ltd., Camera House, Farringdon Avenue, London.)

This is a small arc lamp (for the optical lantern or enlarger), which can [illegible] ked from the ordinary [illegible] current. The lamp



is mounted on a tray fitted with gear-wheel adjustments for sideway movement of the arc, as well as for raising and lowering. Similar adjustments are provided for separating the carbons. The supporting pin of the tray turns down flat with the base, so

that the complete lamp, with the resistance provided with it for use with currents of different voltages, packs into a case 9 by 13 by 5 ins. The complete outfit, with flexible connection and plug for attachment to any electric light fitting, costs £1 16s. with 100 volt resistance, or £2 8s. with 250-volt resistance.

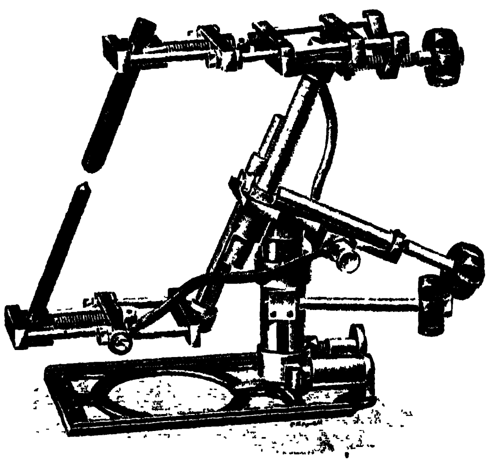
The lamp is also made in a cheaper model without the mechanical movements, the prices in this case being £1 10s. and £2 2s. respectively.

The carbons for either pattern are sold at a price of 4s. 6d. per hundred pairs.

THE "UNIVERSAL" HAND-FEED ARC LAMP.

(Made by Newton and Co., 3, Fleet Street, London, E.C.)

The special features of this new lamp are that it takes an extra long length of carbon, and allows of the arc being brought quite low down in the lantern. This, as shown in the drawing, is secured by the slanting build of the lamp pillar. Practically the whole of the distance from the base of the lantern to the centre of the condenser is available for the lower carbon, thus allowing the lamp to be used for a much longer exhibition than usual with-

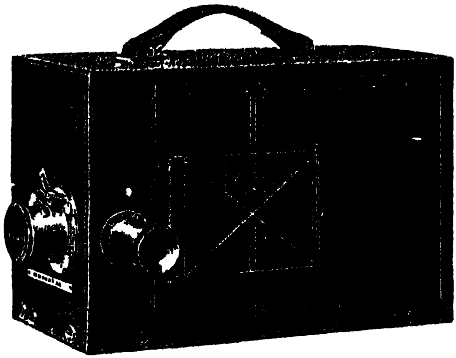


out insertion of new carbons. The mechanical adjustments include the raising and lowering of the arc as a whole, separation of the carbons and to and fro movement of the upper carbon, in addition to sideway adjustment of the arc. The workmanship of the whole lamp is of the very best, all the working parts moving with the greatest smoothness. The price of the lamp is £5 5s.

"N.-S." CINEMATOGRAPH APPARATUS.

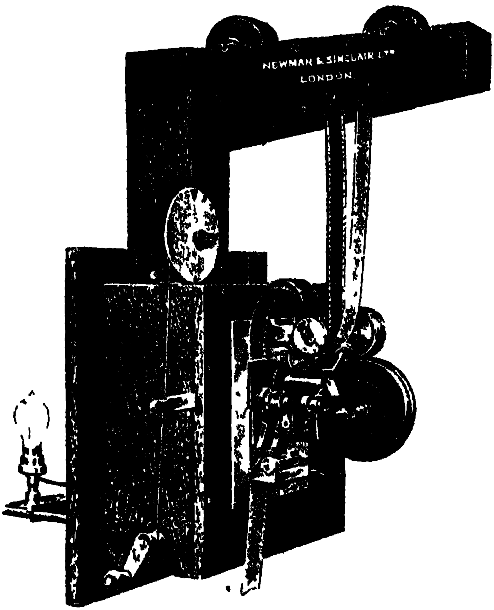
(Made by Newman and Sinclair, Limited, Whittington Works, Highgate, London, N.)

The newly-established firm representing the fusion of the commercial direction of Mr. James A. Sinclair and the genius in mechanics of Mr. A. S. Newman has introduced a number of cinematograph instruments of quite new design. In the cinematograph camera the film boxes in place of being vertically one above the other are placed side by side, thus making the camera squarer in shape and more stable, whilst providing other facilities. This construction means that the film is led from the box through the exposing mechanism, and then takes a curved path back into the collecting box. Yet in consequence of the special mechanism the film, as we have proved by our own examination, is most easily threaded, whilst it is caused to travel from one spool on to the other without being subjected to tension at any portion of its



journey The film boxes, by their special design, avoid friction of the film through the velvet light-trap. The act of shutting the camera door on insertion of the film box automatically opens the jaws of the velvet trap so that electrification of the celluloid material from this cause is obviated. Though shut in an instant, the film-boxes require a certain knack in opening, thus protecting the contents from accidental damage by light. Perhaps the most valuable feature of the camera is that for viewing and focussing the picture. A small mirror, mounted at an angle of 45deg. to the lens-axis, is placed on a sliding frame just behind the lens. When pushed down into position the picture is clearly seen and focussed through the magnifier on the side of the camera. The mirror fitment has simply to be raised, when the instrument can be at once started working. Another adjustment allows of the film being marked when passing from one section of a subject to another. In this

case no part of the film is cut away, but a projecting tongue is formed in it, which can be immediately found when handling the film in the dark room for development. The lens may be of from 2in. to 10in. focal length, and is affixed from outside the camera, whilst the shutter, with its adjustments for speed, is likewise accessible from the front. A special pattern of iconometer finder is provided in the shape of the metal frame seen in the drawing. A series of notches are cut in the diagonal bars and an elastic

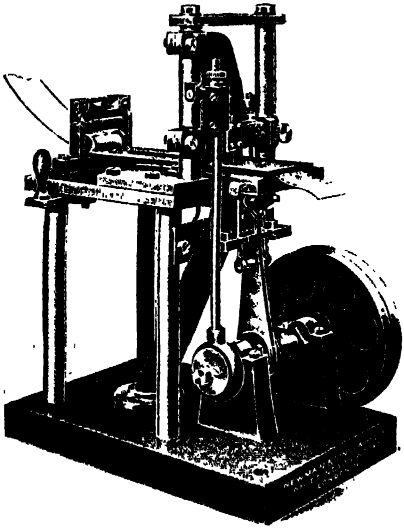


band, run round any given four, shows a picture for a lens of any given focus. The great strength and perfection of mechanism are a feature of the camera which one expects of a mechanician such as Mr. Newman. Complete with two film-boxes, but without lens, and covered in finest black leather, the price is £53, with film-boxes of size to take 400ft. of film. With film-boxes for 500ft. film the price is £54, the camera being slightly larger in this case.

Similar refinements of mechanical construction are introduced into the "N.S." printer, in which, like the camera, the negative and positive films are led without subjecting them to tension, whilst at the same time the instrument provides for variations in the width of the commercial film and for a shrinkage of the film negative. Moerover, the means by which the negative is caused

to travel with the positive avoids sticking of the two together, whilst the pressure is in operation only during the actual period of exposure and over the particular section of film being exposed. The film can be run to print ten pictures per second, though the makers recommend an average of five pictures. The illustration shows the printer erected for work. Complete for use the price is £30 10s., whilst at a price of £33 10s. the machine is supplied to print a film-maker's name or trade-mark on each picture.

Messrs. Newman and Sinclair recognise the immense importance of accurate perforation of the negative film by supplying a per-



forating machine of their own design, in which the greatest accuracy of perforation is secured, whilst at the same time the machine may be operated by an unskilled hand. The machine allows of the most minute alteration in gauge of perforation and of constancy in this respect when the perforator is set to a given standard. The machine is made throughout to a degree of accuracy such that the gauge may be shortened or lengthened to as small an amount as 1-100th of an inch per foot of film. The adjustments, which are rapidly made, allow of the negative being perforated longer than the positive to allow for shrinkage in development, or to perforate the positive, so that after development shrinkage may leave the film exactly at standard length. The perforator is sold complete at £30.

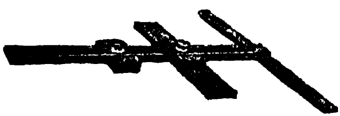
We must also mention among these high-class instruments for

cinematograph work a tripod stand for the taking camera, which is also a piece of apparatus extremely useful to the Press photographer using large cameras or to the lantern exhibitor. The tripod is of two-fold pattern, each leg being adjustable by a sliding movement which is fixed by one screw only in each leg. The head rotates, the moving parts being of well-seasoned mahogany secured from deformation by beech dowels fitted through the layers. A special feature of this head is that the working parts are instantly dismantled, so that it can be taken apart, cleaned, and put together again in a couple of minutes. An ingenious worm-wheel movement rotates the head without the faintest evidence of back lash, whilst the worm can be instantly thrown out of gear when it is necessary to alter the direction of the camera quickly. The price of the tripod, with revolving head, is £8 10s.; with fixed head, £4 4s. Though of enormous strength and rigidity, the tripod is below the average weight.

THE "H. L." GLASS-CUTTING GAUGE.

(Sold by Hunters, Limited, Poppin's Court, Fleet Street, London, E.C.)

This is a most useful accessory for the photographic worker who has occasion to cut up sensitive plates in the dark room, since the gauge is set to the two dimensions which the plate is required to be when trimmed down, and the actual operation of cutting can then be done most certainly and quickly in absolute darkness. The way in which it is used will be clear from the illustration. The two sliding pieces on the long limb of the gauge are set one to the length and the other to the breadth which the plate is to have. The plate is then laid under the gauge, pushed against the first stop piece, and a stroke of the diamond given along the angle piece supporting



the graduated scale. The first sliding piece is then pushed up against the second, the plate turned round, again pushed up to register, and the second cut made. Of size sufficient for cutting plates, however large, down to 15 by 12in. or smaller, the price is 15s.

THE EASTMAN TRIMMING DESK.

(Made by Kodak, Limited, 57 to 61, Clerkenwell Road, London, E.C.)

In this new pattern trimmer the principle adopted is that of moving the print held firmly on a board against a cutting blade which has a little play. As shown in the drawing the blade is placed sightly above the board, which latter has only to be pressed on the edge next to the worker in order to take off the portion of print not required at one even stroke. The springs of the board

bring back the latter to its position on pressure being released. The trimmer is thus very rapid in action, and the further advantage is that the bar under which the print is guided is made of transparent celluloid, so that the whole of the subject right up to the cutting

edge of the blade can be seen when trimming. The trimmer is fitted with graduated scale on either side of the board, and is most solidly made in varnished pine. It is issued in one size only, namely, with a blade 12½ ins. long. The price is 17s. 6d.

THE "VOLUS" DRAINING RACKS

(Sold by J. J. Cooper and Son, 25 King Street, Gravesend.)

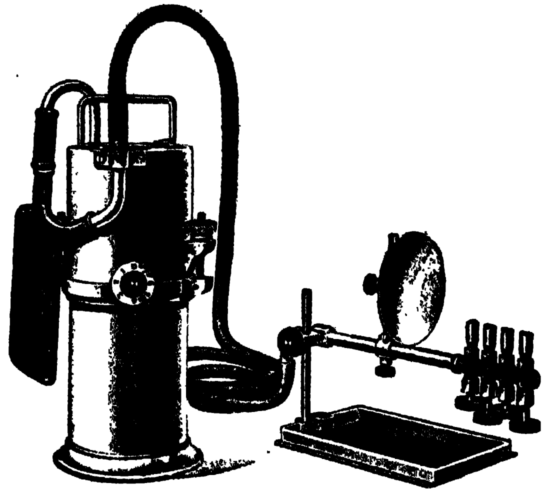
In this rack the makers have designed an accessory which can be either fixed to the wall or stood on the table, and in either position allows of the negative being placed film down and touching the rack only at two minute points. Moreover, the plate takes a diagonal position, so that any adhering water readily drips off, though not upon other negatives in the rack. The arrangement is such as to provide an excellent circulation of air among the negatives, and we can thoroughly recommend the rack as designed with evident regard to the rapid drying of plates. The "Volus" racks are supplied in white enamelled metal, and also in zinc, at prices obtainable on application to Messrs. Cooper.

THE "KLIMAX" ACETYLENE GENERATOR

(Sold by W. Butcher and Sons, Ltd., Camera House, Farringdon Avenue, London.)

In this very portable, yet strongly made, generator, the carbide is contained in the base, the upper portion of the generator

being a tank from which water is admitted into the carbide compartment below. The water drips down a central tube, through the perforations in which it reaches the carbide. The gas escapes by the inverted U-tube, through a rubber regulating bag, from which it passes on to the jet. The apparatus is most simple in construction, the working parts are readily accessible for cleaning, and in operation the generator is extremely handy. For those requiring



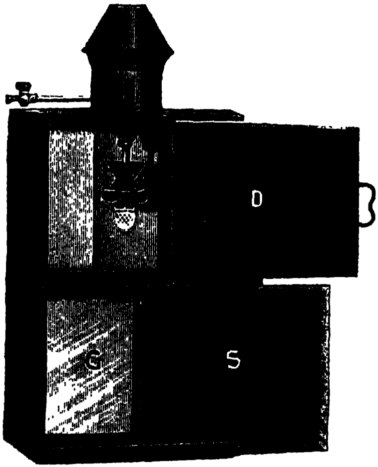
a light for the optical or enlarging lantern without the aid of gas or electric supply, the "Klimax" is a very useful equipment. The generator takes 1 lb. of carbide, the tank holds one pint of water, and the complete apparatus stands only 14 ins. in height. Complete with a 4-burner jet fitted with reflector, tray, and 3 ft. of rubber tubing, the price is £2 2s.

WRATTEN DARK-ROOM LAMPS.

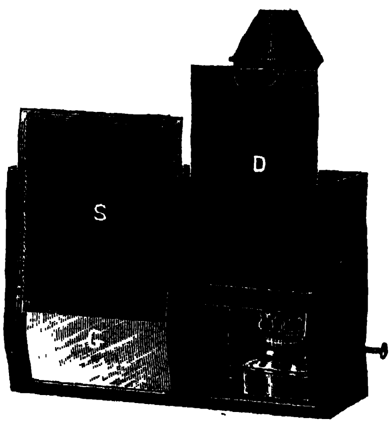
(Sold by Wratten and Wainwright, Limited, Croydon.)

A new pattern of dark-room lamp, specially designed by Messrs. Wratten for use with safe-lights, such as those made by them for slow, rapid, ortho', and panchromatic plates, has the novel feature that the light-filter is protected from the heat of the lamp by a glass screen. The lamp is made for oil, gas, or electric light, and in each pattern special provision is made so that the whole supply of air for the lamp enters between the glass screen and the light-

filter, thus keeping the latter cool. We must say a good word, too,



for the efficient light-trapping, both of the filters and of the doors which give access to the light. Of size to take the Wratten 10 x 8



filters, the price of the lamp for oil, gas, or electric light is 15s. complete, with one safe-light.

THE A-KLA DAYLIGHT LOADING PLATE-HOLDER.

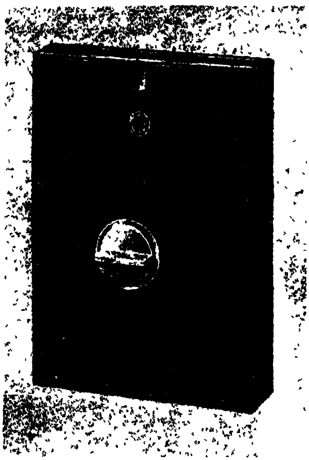
(Made by The A-kla Company, Sale, Cheshire.)

This system of carrying plates face to face in a daylight sheath, fully described in last year's "Almanac," has now been adapted by the A-kla Company, so that it can be worked in conjunction with cameras taking the ordinary single metal slide. The modified form of fitment for this purpose is shown in the illustration, the method of using it being on the lines of the previous model. To those who may not have seen our description last year it will be sufficient to say that any number of pairs of plates are carried in the thin metal

sheaths and are transferred for exposure to the "A-kla" single metal slides, being afterwards removed therefrom and brought together again in the original enclosure, all these operations, which are very rapidly carried out, being done in full daylight.

A further accessory for photography on the "A-kla" system is a developing tank for the 5 by 4 and half-plate sizes. This, as shown in the illustration, consists of a hard wood tank fitted with a screw plug and light-tight cover. The method of transferring a pair of plates from the metal envelope to the tank for development is as follows :—*Unscrew the plug from the tank and then slide a pair of plates into same, seeing that the flare of the metal cases engages with the runners at the side of the tank, also that the slitted face of the plate case is facing the hole in the tank. When the plates are at the bottom of the tank, place the cap upon same. When this* has been done, separate the plates by pulling upon the wire in the usual way, and then, by means of the knob projecting through the hole in the tank, push the supporting lever underneath the slit of

the plate case, double the wire up and place it in the hole, after which screw on the wooden plug. This now forms a secure liquid-



tight and light-tight tank. The developer, to the amount of 6 ozs., is then poured in through the cover, the form of which delivers it in a stream down each side of the tank.

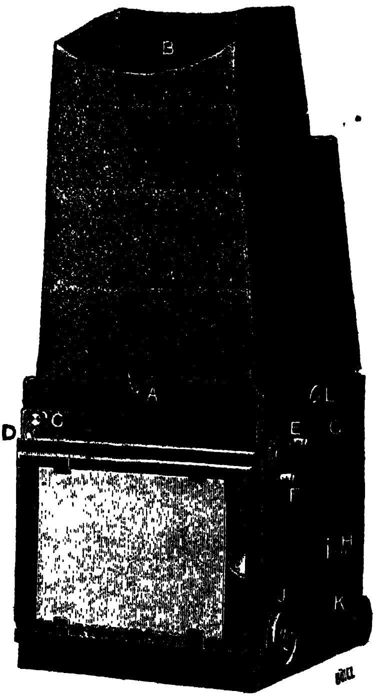
THE VOIGTLÄNDER "VIDA" REFLEX CAMERA.

(Made by Voigtlander and Sohn, 12, Charterhouse Street, London, E.C.

This is the latest model reflex camera, made by the celebrated Brunswick firm of opticians entirely of light metal, saving only the frame and runners of the focussing screen. While not exceeding the average weight of a reflex instrument, constructed largely of wood, the "Vida" secures the immunity from shrinkage which should particularly fit it for use under trying conditions of climate. In addition to this feature it possesses the convenience of the automatic putting down of the mirror when re-winding the focal-plane shutter. This makes one movement the less, and thus relieves the instrument from the charge of slowness in action which is sometimes levelled against reflex cameras in general. We know of only one other instrument in which this simultaneous action of shutter and mirror is secured.

The shutter in the "Vida" is that of the latest Voigtländer pattern, with which, however, some of our readers perhaps may not be familiar. Let it be said that the adjustment for width of slit and for time exposures is made—in either of the set or run-down position of the blind—simply by pressing in a small disc, seen within the rim J of the figure, and then turning the circular plate

to which this small disc is attached until the width of slit is seen through an aperture in the plate. Once set in this way the shutter remains at this slit-width, and is wound every time to the same speed by turning the disc E by the pair of milled heads F. This, as we have said, both winds the shutter and puts down the mirror. The shutter is of the self-capping type, so that the plate is fully protected after exposure. In conjunction with a series of spring tensions, operated from the opposite side of the camera, the full range of speeds is obtained from 1-12th to 1-1,000th of a second.



A further new feature with the Voigtländer reflex is the masking device for the ground glass, to show the horizontal or vertical picture corresponding with one or other position of the plate, or rather of the rotating back with which the camera is fitted. The masking bars are operated by moving a lever close to the winding key of the shutter, but not quite correctly represented in the drawing.

The extension is provided very rigidly by four brass racks, giving a maximum distance of 10½ ins. from plate to lens—diaphragm, but an extension tube can be fitted to the camera front, allowing of over 14 ins. extension being obtained, and thus enabling the user, as occasion requires, to employ lenses of longer focus or of the telephoto type. The lens front has about half an inch of rise and the same amount of fall, whilst the ground glass hood is now made with a metal cover perfectly enclosing it when folded, and is sprung so that on pressure on the button A the hood erects itself to the full height of 8½ ins.

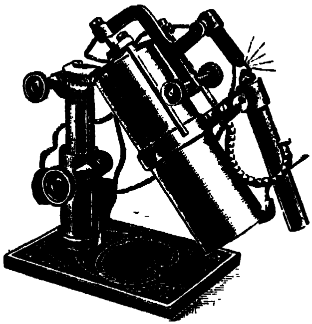
From these movements it will be seen that the reflex is quite an instrument of precision and well adapted for hand-camera work. The price, in the only size in which it is made, namely, for quarter-plate or 9 x 12 cm., is £21 5s., inclusive of the lens, which is the Voigtländer "Heliar," of 7½-inch focus and $f/4 \cdot 5$ aperture, and three

double dark-slides. Perhaps as eloquent a testimonial as any which we can give to the camera is to say that it allows of the full quality of this fine lens being secured with great convenience and certainty.

THE HUGHES SELF-ADJUSTING PORTABLE ARC LAMP.

(Sold by W. C. Hughes and Co., 82, Mortimer Road, Kingsland Road, London, N.)

In this lamp, which is of size to go into any optical lantern, the arc is entirely self-regulating, whilst the lamp, as supplied, complete with resistance and flexible connection, has only to be con-



nected with an ordinary electric-light fitting. It is sold in three sizes suitable for direct current of various voltages at prices as follows :—

6 amp lamp, 100 to 250 volts	£4 10 0
10 amp. lamp, 100 to 120 volts	5 0 0
10 amp. lamp, 200 to 250 volts	5 10 0

At an extra cost of about 10 per cent. the lamp can be supplied to work on alternating current.

VICTOR DATING STAMPS.

(Made by the Victor Company, 2, The Parade, Enfield Highway, Middlesex.)

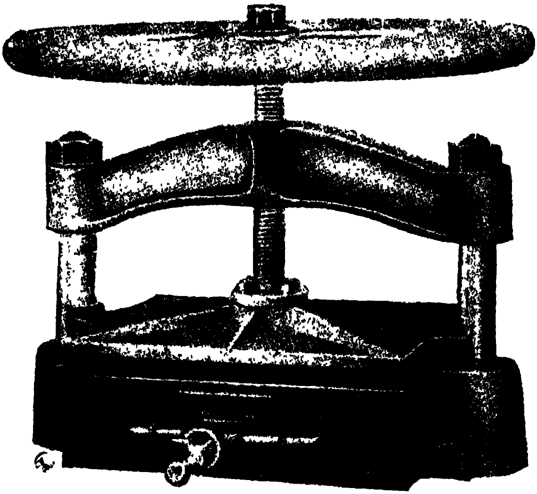
These very useful accessories for the photographer, or photographic dealer, are supplied in solid brass or nickelled metal. While providing a daily date in the usual way, the stamp permits of the mounting of any suitable wording around the date entry, the accessories being most strongly made. Prices, brass, 5s. 6d.; nickellel metal, 4s. 6d.

THE "MORGAN" DRY-MOUNTING, PLATE-MARKING, AND EMBOSSING OUTFIT.

(Sold by O. Sichel and Co., 52, Bunhill Row, London, E.C.)

We have in past issues referred to this new and patented method in which a metal folder containing a matrix is used in a hot press

for the dry-mounting of photographic prints, the system having the further advantages to the professional photographer of producing, by the same pressure which attaches the photograph, also the plate-marking of the mount and the embossing of any design or lettering on another portion of the mount. The method thus means that the photographer, in possession of a few of the mounting folders, is able to draw from his stock of plain mounting papers or boards and to use these as mounts of most decorative and pleasing effect. The system at first introduced confined itself to a simple plate-mark or relief



design, but has now been further extended by the very simple but ingenious use of a matrix, consisting of a series of plate-marks or relief borders, all of which may be impressed on the mount, or part only of the matrix may be utilised if a suitable mask is placed on the opposing leaf of the metal folder. This extension of the system gives an added power to the photographer using the "Morgan" method, though even in the original and simplest form the results obtained are extremely choice, and are, as we have said, most rapidly and certainly secured.

It will be understood by those who have read the previous articles on the subject that in the "Morgan" method the prints wet from the washing water are pasted on the backs with the "Morgan" special dry-mounter, are allowed to dry—which they do with perfect flatness, owing to the anti-curl properties of the mounting preparation—and are then trimmed and ready for attachment to the mount. The folder registers the print in question, so that a whole

batch of photographs can be rapidly mounted off in this way. The mounter is sold at the price of 18s. 6d. per gallon, estimated to suffice for the mounting of 5,000 cabinet prints, whilst for those who

use the carbon process transfer paper ready coated with the mounter is sold.

Since the first introduction, the presses for use with the process have been further improved by building the gas burners into the press and making the latter of malleable iron, with the cross-bar of arch section, thus securing additional strength. The folders, of which a large series of stock designs are kept, range in price from

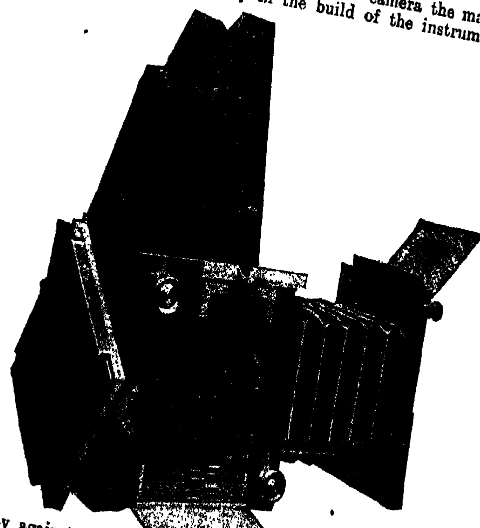
25s. to 35s. for cabinet prints. Those at the lower price are for giving a plate-mark only; those at 35s. for producing cameo or relief effects with a name or design embossed on the mount. The one press, in conjunction with a series of folders, thus allows a photographer to prepare for himself a variety of mounts and folders of distinctive character and of materials (mounting paper or board), a large variety of which are supplied by Messrs. Sichel in various weights, textures, and colours.

The illustration shows a further application of the Morgan system. It is a mount in which the decorative design under the photograph is prepared of mounting paper and affixed by the same pressure which produces the embossing.

THE "MINEX" TROPICAL MODEL REFLEX CAMERA.

(Made by Adams and Co., 24, Charing Cross Road, London, W.C.)

In this model of the Adams "Minex" camera the makers have spared no pains to embody in the build of the instrument every



security against the extremes of heat or damp to which a camera can be exposed in tropical countries. The body is built throughout of high-seasoned teak, and is both bound in brass and fitted with brass angle pieces set into the walls of the body. Brass is likewise used for the whole mechanism, including the rotating back, whilst

the bellows is of Russian leather. While these features necessarily add somewhat to the weight of the instrument they provide the assurance that the worker will be free from troubles due to shrinkage of woodwork or binding of metal parts. The tropical models are issued at an additional price of £7 15s. in the quarter-plate size, £8 15s. in the 5 by 4, or £10 in half-plate.

BRASS FOLDING METAL TRIPODS.

(Sold by F. C. Neddermeyer, 45, Chancery Lane, London, W.C.)

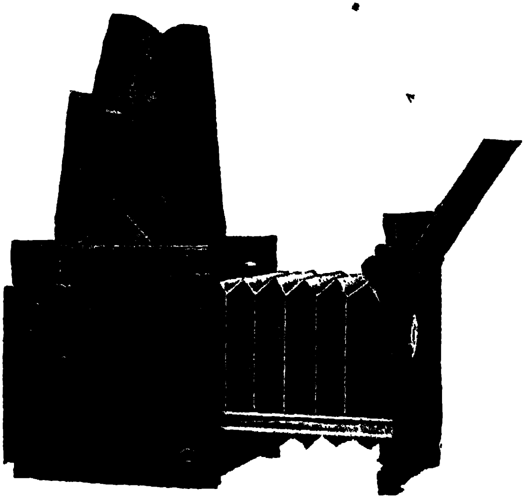
Two series of telescopic metal tripods for the smaller hand cameras are new introductions by Mr. Neddermeyer. The novel and very commendable feature is the total absence of clips or springs. The sections of the telescopic legs are held firmly in place simply by giving each section a slight twist when erecting the tripod, a similar quick twist in the opposite direction being made when closing the stands. In one series the stand is made with an oblong top, in the other with a circular, in each case the top being fitted with standard screw for fitting the standard bushes. Though extremely light, the stands are firm when erected, and supply a most convenient means of making time exposures with the lighter varieties of hand camera. In the case of the 5-section tripod the length when closed is 12½ ins., when erected 50 ins., the price being 16s. With the six-section stand the length, when erected, is a trifle more, and when closed 11½ ins.; the price, 17s. 6d. A cheaper form of the stand is that made in four sections, giving a height of 50 ins. and costing 12s.

THE "RADEX" REFLEX CAMERA.

(Made by Adams and Co., 24, Charing Cross Road, London, W.C.)

In this instrument Messrs. Adams provide a camera of the reflector type (in which they have for many years past been the pioneers) which is priced at a figure considerably less than that of the "Minex," or "de luxe," pattern of Adams's reflex, which we noticed in last year's "Almanac." The difference in price has meant in practice the absence from the camera of certain movements which are in the nature of luxuries. Thus, the automatic device by which the focussing-screen is masked in accordance with the position of the rotating back is not included, nor are the mirror and shutter geared together so that winding the shutter also sets down the mirror, as it does in the "Minex." A less expensive form of rotating back is fitted, whilst the drawer within the camera for the two spare dark-slides is dispensed with. Yet, with these features removed, the camera is nevertheless a reflex instrument of the highest order. It is of long extension, 12 ins. from lens-diaphragm to plate, and has rack-and-pinion rise of 1 in. and fall of ½ in., the Adams's hood and hood-frame (allowing of the ground glass being

immediately wiped), and, finally, the extraordinarily convenient "Minex" shutter, the essential features of which we allude to in noticing the "Vesta" focal-plane camera. With the "Radex," the "Minex" shutter is supplied with a top speed of 1-600 of a second.



The price of the "Radex" complete with three double dark-slides, but without lens, is £19 19s. in the $3\frac{1}{4}$ by $2\frac{1}{4}$ and quarter-plate sizes; £22 in 5 by 4; and £29 in half-plate.

"GLAUKAR" PROJECTION LENSES.

(Sold by Emil Busch Optical Company, 35, Charles Street, Hatton Garden, London, E.C.)

These are a new series of Busch anastigmat lenses made in a series of focal lengths up to 6in., and at an aperture of $f/3.1$. They are issued specially for cinematograph and other rapid photography on small plates, including the fastest description of instantaneous work on reflex cameras. The large aperture and excellent definition given by the lenses over the plates for which they are listed specially fit them for this work, as also for enlarging and projection. When using an illuminant of considerable size, such as the incandescent mantle or Nernst filament, a lens of this large aperture is particularly useful. The "Glaukar" anastigmats are issued in brass mounts, fitted with rack and pinion and with iris diaphragm of hard steel blades, which are thus uninjured in the

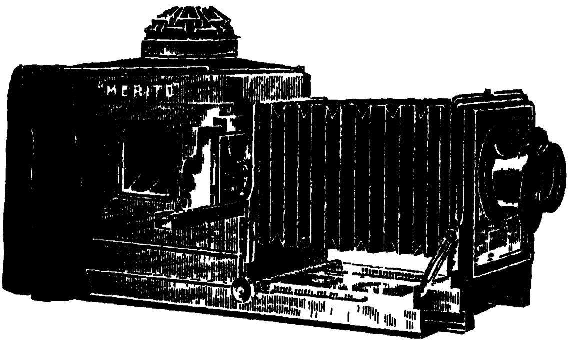
enlarging or projection lantern. The following are the sizes and prices of the series :—

No.		Diameter of Lenses.	Focus.	For Plates.		Price.		
1	....	$\frac{3}{4}$in.	2$\frac{3}{8}$in.	1 3-16in.	by $\frac{3}{4}$in.	£5	0	0
2	....	1 1-16in.	3$\frac{1}{8}$in.	2$\frac{3}{8}$in.	by 1$\frac{3}{4}$in.	5	15	0
3	....	1$\frac{3}{8}$in.	4$\frac{1}{8}$in.	3$\frac{1}{8}$in.	by 3$\frac{1}{8}$in.	6	10	0
4	....	1$\frac{3}{4}$in.	5$\frac{1}{8}$in.	4in.	by 3$\frac{3}{4}$in.	8	0	0
5	....	2in.	6in.	4$\frac{3}{4}$in.	by 3$\frac{1}{2}$in.	10	0	0

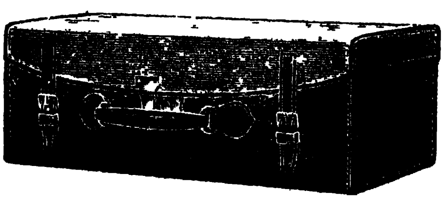
THE THORNTON-PICKARD "MERITO" FOLDING OPTICAL LANTERN.

(Made by the Thornton-Pickard Manufacturing Co., Limited, Altrincham.)

In this new model of the folding lantern, which we noticed in last year's "Almanac" on its first introduction, considerable improvements have been made, the lantern now being constructed without a single loose part, and, in consequence, being most rapidly erected for use. In fact, the few moments required for removing



the lantern from its travelling case and preparing it for use are practically no more than are needed in getting ready a lantern of



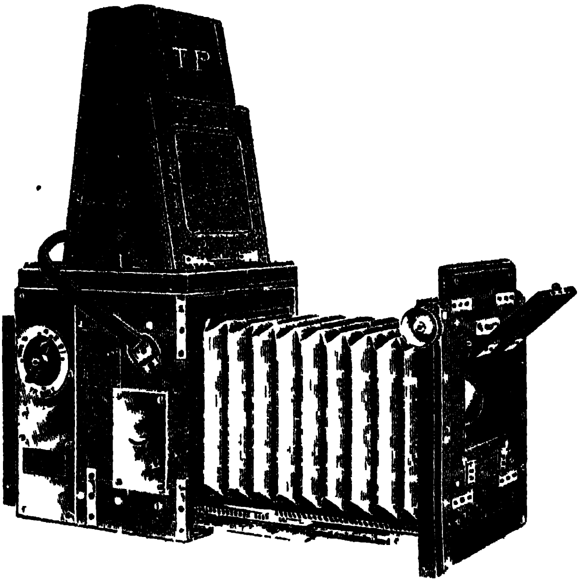
the ordinary type. The "Merito" is fitted with 4$\frac{1}{4}$ ins. condenser, and all the usual fittings in the way of focussing, slide-carrier, etc. The lime tray is very neatly mounted under the metal floor of the

lantern, and is moved to and fro with a smoothness which is unusual in optical lanterns. Complete in leather case with slide-carrier and lime jet, the price of the equipment is £9 9s. It is one which a travelling lecturer will appreciate.

THORNTON-PICKARD REFLEX CAMERAS.

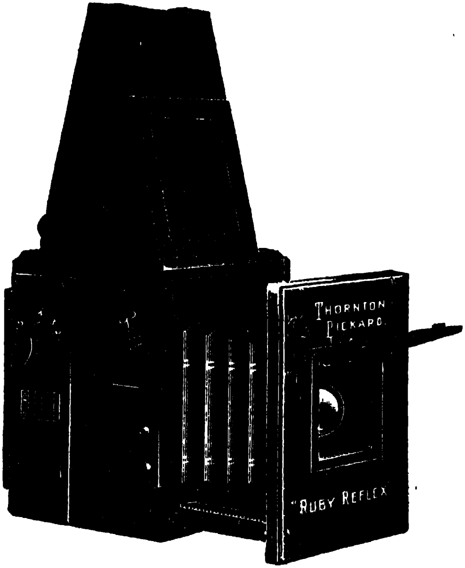
(Made by the Thornton Pickard Manufacturing Co., Limited, Altrincham.)

The "Ruby" and "Duplex" cameras of this type have been further improved this year. The makers retain the hood, which is made on a loose frame so that it can be placed at right-angles to its normal position and thus permit the photographer



to create the impression that he is photographing in a direction other than that in which the lens is actually pointing. A minor improvement is the addition of a lock to the mirror, automatically actuated on closing down the hood The mirror is thus held steady whilst the camera is closed for carrying. In the single extension pattern—the "Ruby"—and in the double extension—the "Duplex"—these reflex instruments retain the highly convenient self-capping "Unit" focal-plane shutter, together with the other features which the Thornton-Pickard Company have embodied in them in their characteristic high class workmanship The mirror and shutter

mechanism are similar in the two models, the differences between which are chiefly in the other movements of the camera, and will be



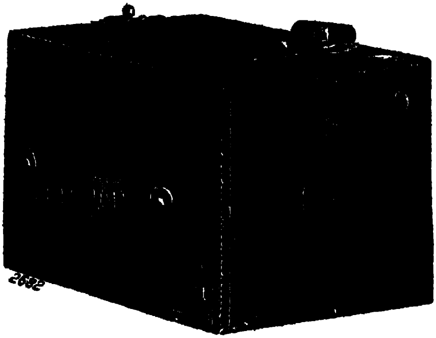
understood from the accompanying illustrations. The "Duplex," complete with three plate-holders, but without lens, is sold at £10 10s.; the "Ruby" at £8 10s.

"ENSIGN" BOX-FORM FILM CAMERAS.

(Made by Houghtons, Limited, 88 and 89, High Holborn, London, W.C.

A series of five distinct sizes of camera of this popular type are a new introduction with Messrs. Houghtons, who have specially laid themselves out to produce this class of camera at their Walthamstow works. In doing this they have evidently—if we may judge from the cameras before us—proceeded with much regard to the production of a strong, serviceable camera, which will stand a very considerable amount of hard wear. Not only that, but the construction and fittings are exceptionally good for cameras issued at such low prices as 5s. to 21s., which latter is the price of the 3¼ ins. or largest size "Ensign." In the case of each size the spool chambers are very efficiently made for carrying the film, the single lens is well mounted and provided, in all but the 5s. camera, with a series of three stops, "everset" shutter, with one instantaneous speed, as well as time exposures, and even in the 5s. model ground-

glass finder is included, whilst in the others two finders, for upright and landscape pictures, are fitted Buyers and dealers anxious to encourage the use of popular film cameras cannot do better than

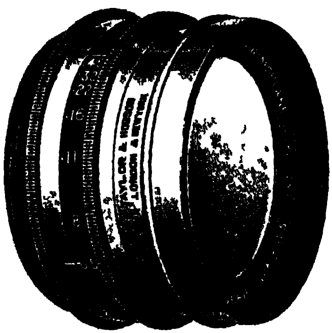


make the acquaintance of these very substantially built instruments, the full series of which are for spools 2¼, 2¼, 3¼, and 3¼ We illustrate one of the models—namely, the 2¼a (5s).

PRIMOPLANE COOKE LENSES, SERIES VIIA.

(Made by Taylor, Taylor, and Hobson, Limited, Stoughton Street, Leicester.)

In the 1909 "Almanac" we reviewed the first lenses introduced in this series, which consists of finely corrected wide angle anastigmats working at $f/6\ 5$ At first a 5 inch lens only was listed, but now lenses of 4, 5, 6 and 7 inches are available These are

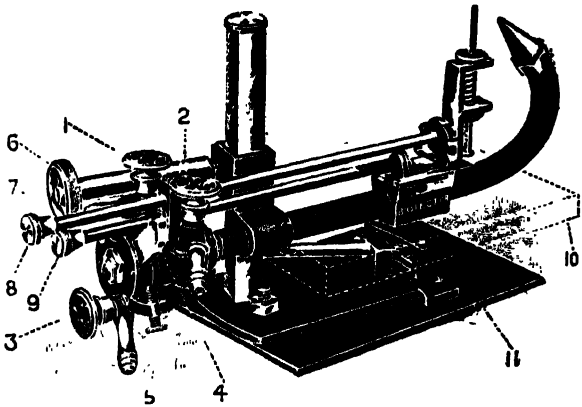


designed to cover half plate, whole plate, 10 by 6, and 12 by 10 plates respectively, the prices ranging from £3 17s 6d to £5 12s. Lenses such as these are very useful on small cameras, as they allow the rising front to be used to the fullest advantage

THE BEARD PROJECTOR JET.

(Made by R. R. Beard, 10, Trafalgar Road, Old Kent Road, London, S.E.)

In this new type of jet Mr. Beard has provided an instrument allowing of the use of the ordinary house-gas supply or of the hydrogen from the cylinder. The jet is fitted with three adjustment valves or supply taps—1, the hydrogen inlet; 2, oxygen inlet; and 3, oxygen inlet for injector. When using as a mixed jet connections are made to the valves 1 and 2, 3 being closed, whilst when employing house-gas the supply is connected with 1 and the oxygen from the cylinder supplied to valve 3, 2 in this case being closed. Mr. Beard sup-



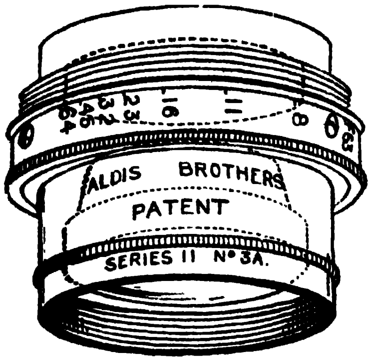
plies an automatic regulator giving a pressure of from 10 to 15 lbs. per square inch, the use of which is advisable in order to obtain the maximum amount from the jet. We cannot speak too highly of the efficiency of the jet, nor of the smoothness of its mechanical adjustments. Up and down and crosswise movement of the jet is secured by rack and pinion movement with great smoothness, whilst the lime holder is supplied with a similarly smooth winch-screw for moving it to and fro from the nipple, and with a rapid adjustment for turning the lime.

THE 3A SERIES II. ALDIS ANASTIGMAT $f/6.3$.

(Made by Aldis Brothers, Old Grange Road, Sparkhill, Birmingham.)

In this addition to the Aldis lenses an anastigmat of large aperture and of small dimensions is offered at a very moderate price. In the lens submitted to us the focus is 8 ins., but the diameter of the lens-barrel is only a shade over 1½ ins., so that, though a very efficient lens for half-plate or postcard work, the new 3A can be fitted to as small a diaphragm shutter as the No. 3 "Koilos," though in this case the effective aperture of the lens is reduced to $f/6.8$. The special construction of the lens includes a front component

of deep curve, yet the definition over the full plate, even with considerable rise of front, shows that the lens is an excellent instrument



for all descriptions of photography. The illustration shows the exact size of the lens, the price of which, with iris diaphragm, is £3.

THE HINGELESS FILM-PACK ADAPTER.

(Made by J. H. Dallmeyer, Ltd., Denzil Road, Neasden, London, N.W.)

In this receptacle for the all-convenient film-pack the hinged back is dispensed with. The film-back, as purchased, is slipped into the adapter at one end and held in place by a catch. The projecting tabs are brought through the slit at the other end of the adapter. This simple type of construction makes the pack both lighter and cheaper. Finished in best quality mahogany the prices are as follows :—3½ by 2½, 12s. 6d. ; quarter-plate, 13s. 6d. : post-card and 5 by 4, 13s. 6d. ; half-plate, 15s. 6d. ; 7 by 5, 16s. 6d.

"ADON" TELEPHOTO LENSES.

(Made by J. H. Dallmeyer, Ltd., Denzil Road, Neasden, London, N.W.)

Messrs. Dallmeyer, as the result of new calculations and the use of fresh types of glass, have made improvements in the "Adon" lens which allow of the full aperture being used for obtaining particularly sharp definition. The lens is still issued in the short form of mount reviewed in last year's "Almanac," and at the prices hitherto prevailing. Under the new type of construction a further modification of the "Adon" has been introduced working at an aperture of $f/10$, and giving, with a camera extension of about 8 ins. a focal length of 20 ins. Used in this way the lens is a very convenient telephoto of the fixed-focus type. A spiral adjustment allows of a moderate alteration being made in the focal length, and the lens is thus an exceedingly useful one for the Press photographer. Mounted in aluminium with iris diaphragm, with apertures from $f/10$ to $f/64$, the price is £8 8s. The outside

dimension of the flange is 2¾ ins., the length of the lens-barrel 3 ins.

A miniature "Adon" for use with quite small cameras (those taking a plate 2-5/16 by 1¼) is a third new pattern made to work at an aperture of $f/9$, and provided with a scale mount serving to focus objects from infinity to 6 ft. This little lens is just under 1½ ins. in diameter, and has a lens-barrel 1⅜ ins. in length. It should be a useful instrument for the innumerable small cameras. The price is £3.

THE 1A. "GRAFLEX" CAMERA.

(Made by Kodak, Limited, 57 to 61, Clerkenwell Road, London, E.C.)

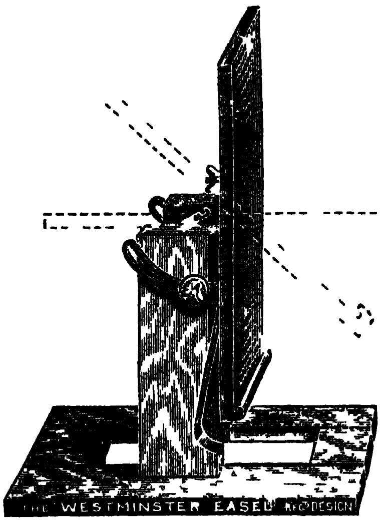
This addition to the "Graflex" series of reflector cameras takes a picture 4¼ by 2½, the camera being built the landscape way of this size of plate. The lens front is racked out on a folding base-board, and allows of a distance of 6¾ ins. from lens panel to film. The hood, which is instantly erected on a trellis support, is 8 ins. in height, giving a clear view over the focussing screen. The shutter is the well-known "Graflex" focal-plane, with four fixed slits in the blind, in addition to a fifth, the full length of the plate, for time exposures. The shutter is of the beautiful smoothness of working which is doubtless familiar to those who have handled other patterns of the "Graflex." The makers also arrange a locking device, whereby the shutter cannot be wound until the mirror has been put down again after exposure. Whilst providing pictures of very fair size, this instrument offers the advantages of reflex focussing within the total bulk of 9½ by 5½ by 3 ins. The drawing shows the arrangement of the spool holders, which take the ordinary Kodak daylight-loading cartridges. The price (without lens) is £12 10s.

THE "WESTMINSTER" ENLARGING EASEL.

Sold by the Westminster Photographic Exchange, Limited, 119, Victoria Street, Westminster, London, S.W.)

This easel accommodates bromide paper up to 15 by 12 size, being marked out for this size and for all others down to lantern plate 3¼ by 3¼ inches, the Westminster Company recognising that an enlarger is as good an apparatus as any for making lantern slides by reduction by artificial light. The Westminster easel provides the means of adjusting the bromide paper to the negative and thus dispenses with certain movements of the enlarger. There is no doubt that the proper method of adjusting the enlargement on the bromide paper is by moving the paper, and not the negative, in the stage of the enlarger, since the latter plan—in nine cases out of ten—will cause incomplete illumination of the negative. The Westminster easel allows of an up-and-down and rotating movement being given to the bromide paper just as easily as a negative is moved in the stage of a modern enlarger, and the particular virtue of the apparatus lies in the fact that the adjustment is made very conveniently and quickly with one hand, simply by loosening a set

screw at the back. A similar screw on the side allows of the easel being tilted forwards towards the lantern or backwards from the lantern through a complete right angle, so that it lies perfectly horizontal. In both cases the easel catches with the support, so that it is automatically brought square with the enlarger. The advantage of the horizontal position is that when the enlargement has been focussed on the face of the easel, the latter can be turned back and the bromide paper pinned firmly in place without any risk of shifting the position of the easel, the pressure being simply verti-



cally downwards instead of a thrust against the easel. Further than this, the movement allows of the apparatus being used as a very efficient and rigid lantern stand for an ordinary optical lantern used in a small room; any desired amount of tilt can be given, and the lantern is supported quite rigidly. Not only so, but the table thus provided forms an excellent support to which may be affixed small articles such as coins, flowers, etc., which may have to be photographed. Lastly, when we have finished enlarging upon it—our present state—we find it of service as a book stand or a copy holder for the typewriter. The base of the easel is most substantially made in hard wood, whilst the easel itself is made in varnished pine, tongued, and very fully protected against warping. To the amateur worker who goes in for enlarging, the apparatus should prove a boon in the way of saving time and trouble, and giving a degree of certainty to the work. The prices are:—15 by 12, 21s.; 18 by 16, 37s. 6d.

A special pattern of the easel is also issued, in which a framed plate-glass front is provided for the bromide paper, whilst the apparatus, as necessitated by the glass front, is of still stronger construction. The prices of the special pattern are:—15 by 12, 27s. 6d.; 18 by 16, 37s. 6d.

THE "FALLOWFIELD" POPULAR FERROTYPE CAMERA.

(Sold by Jonathan Fallowfield, 146, Charing Cross Road, London, W.C.)

In the 1911 model of this daylight loading camera for ferrotype portraits of size 1¾ by 2¼ ins. a more substantial body is provided, all the brass parts being nickelled. The camera is fitted with a portrait lens working at $f/6$ in rack and pinion mount with stops for $f/11$ and $f/16$. The plates are supplied in a thin metal box, which is fitted into a chamber built by the side of that forming the camera. A spring presses the plates towards the back of this chamber, and the sliding frame carrying the ground-glass focussing screen brings each sensitive plate in turn into position for exposure. We found this arrangement very certain in its action. After exposure the plate is caused to drop into a German silver tank containing combined developing and fixing solution; from this it is removed, and is finished after a brief rinse. The apparatus is free from complicated working parts, but efficiently fulfils its purpose of providing the means of making numbers of ferrotype portraits with speed and certainty. The price is £3 10s., or complete with tripod stand, £3 17s. 6d., the outfit including a stained wooden box holding the camera, a supply of plates, and a water tank in which to rinse the finished pictures. Daylight-loading magazines, holding 36 plates, 3s. The combined developing and fixing solution is sold at 1s. per bottle of concentrated solution.

THE DALLMEYER TIME-EXPOSURE VALVE.

(Made by J. H. Dallmeyer, Ltd., Denzil Road, Neasden, London, N.W.)

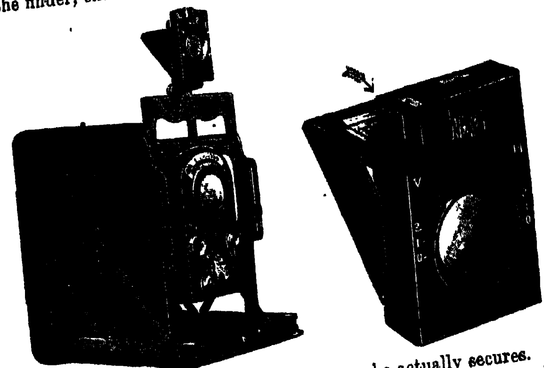
A very neat and tiny valve for automatic exposures with diaphragm shutters is a new Dallmeyer specialty which can be recommended for its minute proportions. The little valve measures less than 1½ in. in length and is about ⅜ in. diameter. It is graduated for a series of exposures as follows:—1/50, 1/25, ⅛, ¼, ½, 1, and 3 seconds. The new valve is issued at 2s. 6d.

THE "IMPERIAL SIBYL" POCKET CAMERA.

Made by Newman and Guardia, Ltd., 17 and 18, Rathbone Place, Oxford Street, London, W.)

In last year's "Almanac" we chronicled the introduction of several new models of this most portable and practical pocket camera. To these an addition has been made in the form of the "Imperial" model, the notable new feature of which is the provision of rise and fall of the lens both ways of the plate. The movement is obtained by sliding metal frames in which the lens is held: a rise of one-quarter the height of the plate in each instance is obtained. A further great improvement is in the finder, Fig. 2,

which is now made of the ground-glass pattern (a miniature camera), and reversible for landscape or upright pictures. Further than this, the tiny lens of the finder is made to move so that the picture in the finder tallies with that actually obtained on the plate when the front is raised. A series of three stopping-places, marked to register with each other both on the actual front of the camera and on that of the finder, enables the user to make certain of the exact correspon-



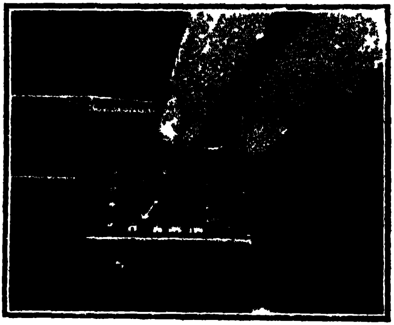
dence between what he sees and the picture he actually secures. In other respects this model of the "Sibyl" has all the virtues of its predecessors—namely, the rigid lazy-tongs extension, the smooth focussing movements, the adjustment whereby the camera can be closed whilst set at focus on a given distance, and will be still at this focus when reopened, and finally the great compactness and freedom from projections. The price of the "Imperial," which is made in quarter-plate size only, for use with "Tessar" f/6 lens, is £16 10s.

"N. AND G." REFLEX CAMERAS.

(Made by Newman and Guardia, Ltd., 17 and 18, Rathbone Place, London, W.)

As we have frequently said in noticing "N. and G." apparatus, as regards excellence of construction one cannot desire a higher standard of quality, and thus, in referring to new models of the firm's reflex cameras, we have only to signalise certain points in which greater convenience or greater permanency of the more perishable parts to extremes of climate is secured. In the 1911 models of the "N. and G." reflex a great gain, as regards convenience in working, is secured by a slight alteration to the shutter. The winding key instead of being fixed, as in the previous models, pulls slightly upwards when making the speed alteration; on being pressed down again the shutter remains set at the particular speed, and is brought to this

each time on winding in the ordinary way. Thus the worker has no need to look at his speed scale unless he wants to reduce or increase the exposure And if he does want this, all that is necessary is to raise the winding key a trifle, turn it backwards or forwards as required, press it down again and give a further minute wind if necessary This alteration is a great gain in practice, and to have it in conjunction with a shutter of the proved reliability of the "N and G is a boon which the hand camera worker should appreciate The time movement of the shutter is also modified so



that the somewhat light touch on the release, when giving time exposures, is not necessary for effective action

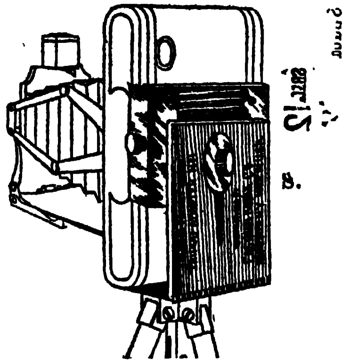
A further new feature of the 1911 reflex is the material of the focal plane blind The makers have spared no pains to secure an opaque material which will not soften or become tacky in tropical heat nor lose its flexibility in extreme cold—the difficulties which a maker of a focal-plane shutter has to surmount Further, the rotating back is now made with an automatic catch, there being no necessity to turn back a lever when going from the one position to the other—a further gain in speed of working With these several additional refinements, among which we would also mention a mirror of greater reflecting power, the "N and G" reflex continues to stand as a model of all that is most efficient and reliable in reflex camera construction

TRIPOD ADAPTER FOR F P K CAMERAS.

(Made by Kodak Limited, 57 61, Clerkenwell Road, London, E C.)

In order to ensure the firm attachment of the convenient Folding Pocket Kodaks, Nos 1 or 1A, to the tripod the Kodak Company have just introduced an adapter which, as will be seen from the drawing, is screwed to the tripod head and firmly clips the Kodak.

This it does with the camera either in the vertical position, shown in the drawing, or horizontally. For this latter position the screw S has simply to be loosened, the camera turned into position, and

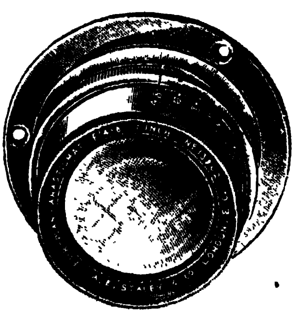


the screw tightened. The price of this very useful accessory is 3s., money which is well spent in thus securing the benefit of use on a tripod.

THE "AEROPLAN" F/4.5 ANASTIGMAT.

(Sold by A. E. Staley and Co., 19, Thavies Inn, Holborn Circus, London, E.C.)

This new universal large-aperture anastigmat is a further member of the Euryplan series of lenses. In it the makers respond to the



demand for a $f/4.5$ aperture, particularly among users of reflex cameras and for portraiture, but it is at the same time an objective for all purposes, since it covers a wide angle at a small aperture, whilst the single components form excellent lenses of long focus. The "Aeroplan" consists of two triple cemented combinations,

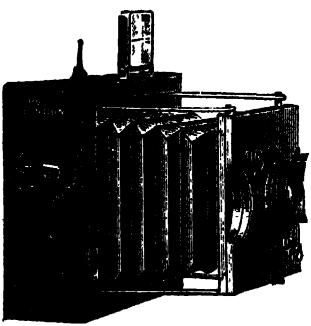
and is of symmetrical construction. The absence of air-spaces in the combinations is doubtless the cause of the remarkably bright definition. The normal angle of view is covered from corner to corner of the plate in an admirable way, and the same remark may be applied to the use of one or the other half of the complete instrument as a lens of about double the focal length. The "Aeroplan" is in short a true universal objective, and the amateur or professional photographer who is restricted to one instrument for outdoor work cannot desire an objective which better responds to the calls upon it.

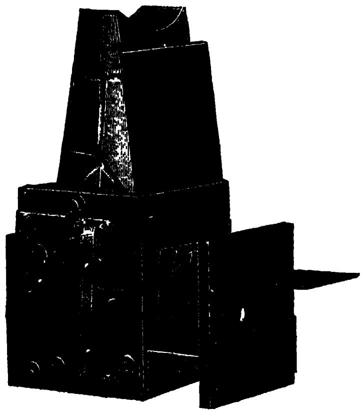
The lenses are made in focal lengths from 2⅜ to 23½ inches, those up to 4¾ inch focus being *f*/4.5 aperture, from 5¼ to 8¼ *f*/4.8, the longer foci being *f*/5 and *f*/5.5. As regards price, the 6-inch lens is sold at £6 5s., in ordinary iris mount, £7 in focussing mount, and £6 10s. in sunk mount, prices which are moderate for an anastigmat of the properties and high quality of the "Aeroplan."

ROSS CAMERAS.

(Sold by Ross, Limited, 3, North Side, Clapham Common, London, S.W.)

In the 1910 model of the "Panros" folding focal-plane camera the makers have modified the construction of the shutter while retaining the conveniences of the previous pattern. These, as noticed in a previous "Almanac," include a wide range of speeds, instant adjustment of the shutter to give bulb exposures while set





at any instantaneous speed, and, lastly, similarly rapid movement to open the blind to full aperture for focussing. The large milled head seen in the drawing winds the shutter in less than a complete turn. The inner key serves to alter the speed: it is slightly raised and placed into one of nine different slots giving speeds, as marked, from 1/1,000th to 1/15th of a second. For bulb exposures the small

knob seen lower down is simply turned to B, when pressure on the release commences exposure which continues until the pressure is broken. This very rapid movement allows of the useful short exposures being given in circumstances where some kind of rigid support can be secured for the camera. Lastly, by turning the knob to F, the shutter being set, a full aperture of the blind is obtained for focussing. It remains open without further attention, and when the exposure is to be made the knob is turned to B or I, as required, and the shutter set by a turn of the winding key. In other respects the camera is issued in the excellent workmanship characteristic of the Ross factory.

A new model of the Ross 3½ * 2½ reflex is a further addition to the series which we have noticed in past issues of the "Almanac." It is built square and fitted with rotating back, thus providing the full facilities in the small convenient 3½ by 2½ size. The outside dimensions of the camera are 5 by 6¾ by 6½ ins. This new model is also fitted with a hood of the pattern seen in the drawing, the hood frame being hinged so as to lay bare the ground glass instantly. A further good feature is the large sky-shade provided for the lens and adjustable at any point. The extension from lens panel to plate is 9½ ins., and the rise of front (actuated by rack and pinion) is just over three-quarters of an inch. Mirror and shutter adjustments remain as in the previous models.

"COOKE" SERIES IIA, *F*/3.5 PORTRAIT LENS.

(Made by Taylor, Taylor, and Hobson, Limited, Stoughton Street, Leicester.)

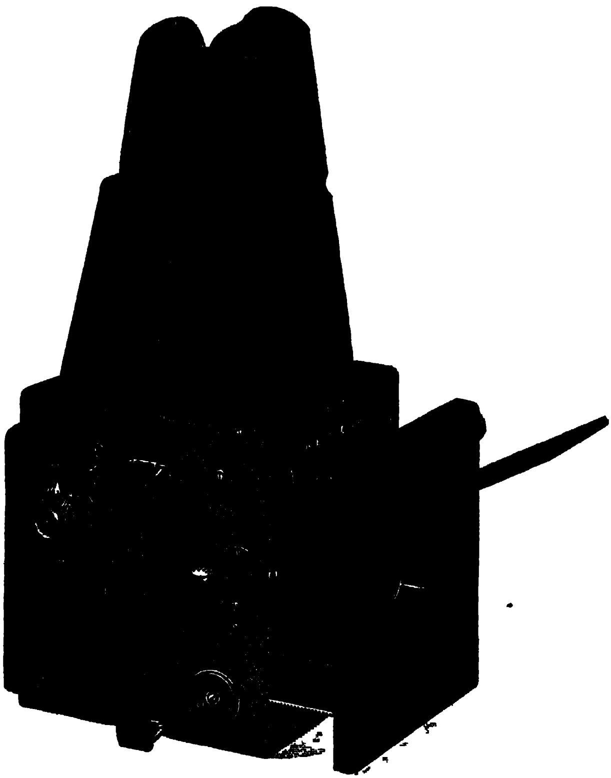
This series of anastigmatic portrait lenses was introduced last year and reviewed in the "Almanac," but only one lens of 12 inches focal length for cabinet size work was then made. Messrs. Taylor, Taylor, and Hobson have now extended the series, adding four more lenses of 5, 6, 8, and 10½ inches focal length, the respective prices being £6, £7, £10, and £14 10s. This series has proved popular, lenses of such a large aperture being specially serviceable for Press photography. We understand that similar lenses of 1½, 2¼, and 3 ins. focal length for cinematograph work can also be supplied to order. A special feature of the longer focus lenses of 5 inches and upwards is that by turning the front combination any degree of diffusion of focus can be introduced. Thus the lens is of universal utility.

THE "BRITISHER" REFLEX CAMERA.

(Sold by A. E. Staley and Co., 19, Thavies Inn, Holborn Circus, London, E.C.)

Messrs. Staley, who for a number of years past have made a special feature of supplying really reliable apparatus at a popular price, have now included among their notable specialties a camera of the reflex type which is British made throughout and has a number of excellent features to recommend it. While it is now difficult for a maker to offer to the public a reflex instrument of quite original design, the "Britisher," as Messrs. Staley style their new introduction, embodies in a most convenient and satisfactory

way the essential features of a high class reflex It is, in the first place, light in weight, the quarter plate instrument submitted to us complete with lens turning the scale at just over 3¾ lbs Next it is compact in bulk, the body itself measuring 6 × 7 × 7¼ ins, exclusive of the milled heads for focussing and winding the shutter,



the depth of each of which is under half an inch The mirror, although mounted on the system by which it is raised by pressure of the shutter release, is provided with an automatic catch so that the camera can be used at any angle or held vertically above the head. The balancing of the mirror is most excellently and lightly done, and we have nothing but praise for the speed and sensitiveness with

which it responds, in conjunction with the shutter, to the operator's touch in making an exposure

The focal plane shutter itself is most simple in use It is of the fixed spring tension type, the full range of speeds from 1/10 to 1/1,000 of a second being obtained simply by turning the winding key until the pointer reaches the speed required The arrangement of the blind is such that the higher speeds are first secured when winding the head Thus, with the shutter set, a slower speed is obtained by winding the key further whilst if a higher speed is wanted it is a matter of a few seconds only to cover the lens with its hinged flap, release the shutter and re wind The use of one or other of these movements as circumstances require allows of any alteration in the speed being most expeditiously made The shutter is also fitted for time exposures, the alteration to which is made with no less rapidity The hood is well arranged having a detachable frame, which is removed in an instant, allowing of the ground glass being wiped or dusted This as reflex users should know, is as important a movement as any since it is difficult to ensure accurate focussing when working with a dirty focussing screen The hood is also self erecting to the comfortable height of 7½ ins , and allows of a full view of all parts of the screen A further novel feature is the provision of clips by which the hood can be inserted in the camera top with the viewing aperture running the length of the camera instead of across it This allows of the photographer taking a position sideways to his subject and thus creating the impression that he is photographing in an opposite direction As regards extension the normal rack on a pair of rigid brass struts gives a distance of 10 ins from lens to plate, but the lens being recessed the panel can be instantly reversed, providing the full extension necessary for the single component of a 5¼ ins anastigmat, which is the focal length suitable for a camera of the quarter plate size The rack and pinion front, giving a rise of just over ¾ in and a fall of just under this amount, is fitted with a large lens shading screen which stops conveniently wherever it is set and is a valuable feature when employing the modern large aperture anastigmat Rotating back fitted with an extra focussing screen and hood for use when using the camera for direct work on a tripod, complete the movements of the instrument in respect to which some final words of appreciation must be said for the good workmanship both of the wood and metal parts the camera is screwed throughout, and in the ordinary pattern provided with the usual black leather cover Messrs Staley also make the "Britisher" as a tropical model in mahogany specially treated to withstand trying climatic conditions, and with a leather covering stretched over the body instead of glued to it

With so many good features to its credit, it will be seen that the prices at which the "Britisher" is issued complete with three double slides, but without lens are extremely moderate They are in the 3½ × 2½ size, £9 9s , quarter plate, £10 10s ; 5 × 4, £11 11s. ; half-plate, £15 15s ; 13 × 18 cms (7 × 5 ins), £17 17s The prices in the Tropical model are —£11 11s , £12 12s , £14 14s , £18 18s , and £20 respectively

THE LUMIERE AUTOCHROME COPYING APPARATUS.

(Sold by the Lumière N.A. Co., 89, Great Russell Street, London, W.C.)

The special apparatus designed by MM. Lumière for making copies of Autochromes by contact is described in its appropriate place in the "Epitome of Progress." We may, however, add here the prices and particulars for the benefit of those wishing to purchase the apparatus ready for use. The price for plates 6½ by 4¾ ins. is 17s. 6d. Extra for carrier taking quarter-plates 2s. 6d. The special screen necessary when thus employing magnesium light for the printing of the Autochrome copy is supplied in size 9 by 9 cms. (3 9-16 by 3 9-16 ins.) at 7s. 6d., the front of the apparatus being made to admit the filter. Extra spirals of magnesium are supplied of various lengths from 8 to 20 cms. (3¼ to 8 ins.) at prices from 1s. 9d. to 3s. 3d. per box of 20, the ribbon being bound up in the wire spiral ready for use. The apparatus is very strongly made, and provides in a useful form the means of copying from one Autochrome on to another under the best conditions of artificial light.

THE "HART" SAFETY FLASH-LAMP.

(Sold by F. C. Hart, 57, Hatton Garden, London, E.C.)

A light and portable flash-lamp which can be taken about without appreciably adding to the photographer's equipment, but can yet be used for both large and small work, is a piece of apparatus of which very few patterns are at present on the market. Such an instrument is supplied under the above name. In the form submitted to us the tray for the combustion of the powder is 7 by 2½ ins., and is made in one piece without solder. It is quickly attached to the head, which carries the ignition device. This head, in turn, is instantly attached to a collapsible extension tube measuring 44 ins. at full length and closing to 10 ins. The lamp can thus be raised to the height which is usually necessary for successful flashlight illumination. In addition to the collapsible tube a light folding tripod of metal is included in the outfit, so that where circumstances permit the lamp can be placed on a table or other support.

The method of ignition is by means of a hinged friction lever; the lever is pulled over by the string, and in its passage ignites an ordinary wood vesta match, which is slipped through an aperture in the head registering with a small circular aperture in the tray. Pulling the lever over the corrugated surface, on the side not seen in the drawing, ignites the match and thereby the powder spread above it in the tray. The lamp may, of course, be used by the method of igniting the powder by means of a small piece of gun-cotton to which a taper is applied —a system of working which is preferred by many workers to the match ignited by friction, the operation of which requires a certain knack and is not perhaps so absolutely reliable as the taper method. In any case, the "Hart" lamp supplies a very convenient means of distributing the powder and raising it to the necessary position, while a larger model for professional and Press use is supplied,

fitted with a longer Russian iron tray suitable for laying out the long train of powder required in making exposures on large interiors and gatherings. The lamp can also be fitted with the "Antinous" release.

THE "PERSPECT" REFLEX CAMERA.

(Made by W. Watson and Sons, Limited, 313, High Holborn, London, W.C.)

In this new addition to the reflex cameras, such as the "Argus," which Messrs. Watson have long issued, and which have been extensively used for Press photography, the focal-plane shutter employed is the "Unit" self-capping pattern, noticed in previous editions of the "Almanac." The advantage in the use of a single key with which the shutter is both set and adjusted to a given speed is one which the practical photographer will appreciate. The shutter can be fitted with a time valve providing a range of timed exposure varying between 3 seconds and ½ second. In other respects the "Perspect" is constructed in the solid and substantial style of the "Argus," being fitted with double extension-rack on either side, which holds the front extremely rigidly and, in the quarter-plate size, provides an extension of 11 ins. from lens-panel to plate. It is also fitted with rack and pinion rising front, and has the hinged hood frame, giving instant access to the ground glass. The "Perspect" is made in both square and horizontal patterns, the former with rotating back of satisfactorily solid build. In the quarter-plate size the price of the square pattern, with three double slides, but without lens, is £12 10s.; in the horizontal pattern the price is £11 1s. Both patterns are made in a whole series of sizes, the square from 3½ × 2½ to half plate and the horizontal from quarter-plate to stereoscopic (6¾ × 3¼).

THE "CALLIOPE" POSTCARD PRINTER.

(Made by the Camera Construction Co., Eagle Works, Durham Grove, Hackney, N.E.)

The "Calliope" is a printing cabinet for negatives up to whole-plate, of compact dimensions, the height being 13 inches and the top 10 x 9 inches. It is arranged for electric light, and there is a convenient outside rack and pinion adjustment for altering the distance of the lamp from the negative. The negative, if of full ½-plate size, is laid in the rebate, a carrier being used for smaller sizes. A sliding bar, fixed by a pair of set screws, provides a stop to which the postcards are fed in printing, and the pressure-back, which automatically switches on the light, is similarly provided with a screw adjustment, serving to bring the back full on to the postcard. As in other patterns of printer, the negative is illuminated by ruby light when adjusting it in position, the same light also illuminating the printing-table. One feature of the printer is the arrangement by which the postcard falls of itself from the negative into a basket placed to receive it on exposure being terminated. The instrument, which is very compact and rapid in use, is sold, complete with three yards of flexible connection and adapter for any lamp bracket, at 30s.; without rack and pinion movement of

lamp, 27s 6d It is also made in whole plate size at 35s, and in 12 x 10 at 42s The "Calliope" is one of the most efficient, compact, and rapid printing machines on the market, though its price is moderate

THE "MANSFIELD" DEVELOPING AND CHANGING BOX.

(Made by David Allan, Whitfield Works, Mansfield Street, Kingsland, London, N E)

This accessory for the tourist is intended for developing a plate or two in dishes, for charging developing tanks or, of course, for ordinary loading and changing of plates It is constructed of metal, with two ruby windows and sleeves for the insertion of the user's hands For use at night, or in a room the arrangement shown in the drawing allows of the operations being seen, a lamp

is placed in front of the circular window and the large window on the top then serves for inspection of the operations The box closes to a space of 12½ by 12½ by 2 inches, and is sold at a price of 15s 6d

THE "HOUGHTON" FOLDING REFLEX CAMERA

(Made by Houghtons Limited 88 and 89, High Holborn London, W C)

On its first introduction by Messrs Houghtons, we reviewed this camera in the "British Journal Almanac" Its reappearance under a somewhat modified form is the result of the makers' aim at producing a pattern of instrument which is automatically safeguarded from damage Obviously when in its working state, the mirror and focussing screen are extended within the interior of the camera The new feature of the "Houghton" instrument is the provision of a locking attachment by which the camera front cannot be closed on its struts until the mirror and ground glass have been suitably disposed against the back frame of the apparatus

Apart from the mechanism by which this is achieved, the camera is practically unaltered in type from that which we have already noticed, the only other radical difference being the quite new pattern of focal-plane shutter. To deal first with the camera: It is made in one size only, namely, quarter-plate. Closed, it measures 7½ by 7

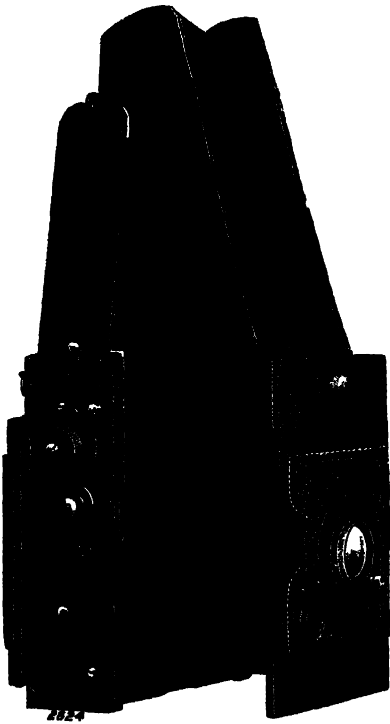


Fig. 1.

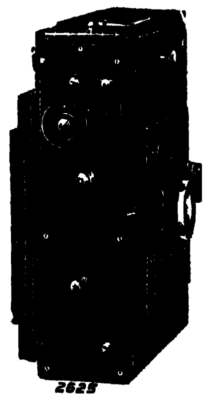


Fig. 2

by 3 inches; in other words, about the size of a 5 by 4 camera of the ordinary focal plane folding type. It is got ready for use by pulling out the front in the same way as a focal plane camera, and then erecting the hood on the two side metal struts, one of which is seen in the larger drawing. It then remains only to release the ground glass and mirror, which is done, for both at once, by turning the small lever seen above the winding key in Fig 1 into the vertical position. When closing the camera the lower strut is locked until the lever is put horizontal, thereby returning ground glass and

mirror flat against the blind of the focal-plane shutter. In actual operation these three adjustments occupy only a fraction of a minute, and the camera thus erected is then ready for use in the manner customary with reflex instruments.

As regards the movements which it possesses, there is first of all that of the lens-panel of one inch, conveniently actuated by rack and pinion. Focussing is done by movement of the lens mount—the customary "focussing mount"—allowing of objects up to within 10 feet of the camera being secured in sharp focus at full aperture. The shutter is of the self-capping variety—a necessity, of course, since the construction of a folding camera does not allow of the mirror bedding against a light-trap. The mirror falls automatically after exposure. We have written before in reference to the pros and cons of a mirror which thus falls again after exposure, so it is right we should say here that the amount of pressure which must be given to the release in order to make an exposure is surprisingly slight, and until we realised that the mirror was one of this type our impression was that we were working with one of the spring-actuated pattern which remains up after exposure. After all, this is a question of the nice balancing of the mirror, which in the Houghton Folding Reflex has evidently had the most careful attention of the makers.

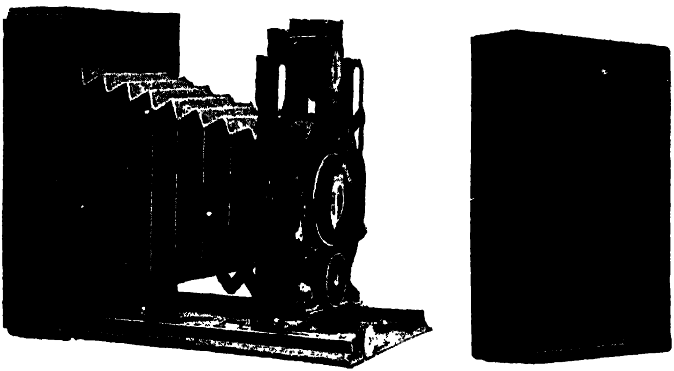
The shutter is a most convenient form of focal-plane. It is set (before winding) to any given exposure simply by slightly pulling out the graduated disc seen in the drawing and placing any given speed against the mark on the camera frame. Once thus adjusted to this speed, the shutter is wound for each exposure by turning the winding key as far as it will go; in other words, there is no need to think about the speed of the shutter when re-winding for each exposure. Quickly made adjustments are also provided for time and bulb exposures, the shutter being altogether as complete a reduction to simplicity as one can readily imagine. A rotating back allows of the view on the plate being instantly obtained either upright or landscape, whilst the size and form of the hood are such as we have found quite convenient in use during a week-end's trial of the camera. Although weight, as well as bulk, has been cut down, Messrs. Houghtons have, nevertheless, retained all necessary strength in the camera, and the instrument as a whole impresses us as one with which long continued work can be satisfactorily done. The price, complete with three double dark-slides and "Ensign" anastigmat of 6 inches focus (the shortest focal length permissible) of $f/5.8$ aperture is £21 10s. The camera alone, without lens, but with three double slides, is priced at £18. The back also carries the Houghton envelope adapter, which can be supplied as an extra at the price of 15s.

THE ADAMS "VESTA" POCKET CAMERA, 1911 MODEL.

(Made by Adams and Co., 24, Charing Cross Road, London, W.C.)

Since we noticed this highly portable pocket camera in the 1909 "Almanac" Mr. Adams has embodied in it certain important improvements which provide within the same minute space additional facilities for the hand-camera worker. Focussing is now done by

means of a straight winch screw fitted to the lens-front, and allowing of extending the camera up to focus for objects one yard away, whilst in the case of all objects from two yards distant to infinity the camera can be set at any given distance, closed, and when re-opened will come automatically into the same focus. But perhaps the most important advance is the building of the "Identoscope" finder into the camera and of connecting it with the lens-front, so that the alteration in view when the lens is raised is shown in the finder both in the ordinary upright position and when the finder is reversed and the rise of the lens-front made landscape way of the plate. In each case the rise obtained is extremely ample—in the upright position one inch; and landscape way of the plate, almost three-quarters of an inch. And this when using an $f/4.5$ anastigmat



fitted in its diaphragm shutter. Such a result is an immense triumph of portability, and in the Adams "Vesta" is secured without the use of elaborate mechanism. All the working parts of the front and finder are exposed, though they and all other parts are perfectly covered when the camera is folded for carrying. In its rapid closing and re-erection for use, the wide range of its lens movements, the efficiency of its shutter, and the extreme compactness of the whole camera the new model "Vesta" is unique amongst instruments of the pocket class. Complete with six slides, single metal, hooded focussing screen, "Zeiss" $f/6{\cdot}3$ "Tessar," and leather case for the slides, the price in $3\frac{1}{4}$ by $2\frac{1}{2}$ size is £14 14s.; in quarter-plate, £17 17s.

THE "VESTA" A MODEL POCKET CAMERA.

(Made by Adams and Co., 24, Charing Cross Road, London, W.C.)

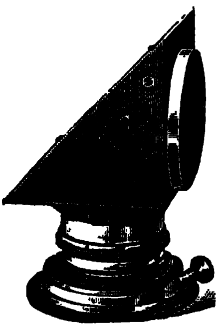
The "Vesta" camera, as noticed on another page, having been improved in a number of respects, Messrs. Adams now issue the instrument in a somewhat cheaper pattern, the A model, at the price of £10, fitted with Ross $f/6.8$ "Homocentric." This includes the

six single metal slides, focussing screen, and case for the slides. The camera thus supplied is practically that reviewed in the 1909 "Almanac." While it has not the valuable "Identoscope" finder, nor the retention of the focussing setting at a given distance, yet it is an extraordinarily small instrument, and one capable of responding to all varieties of hand camera photography.

ROSS PROCESS APPARATUS.

(Made by Ross, Limited, 3, North Side, Clapham Common, London, S.W.)

Messrs. Ross send us the latest improved pattern of the reversing prism made by them for photo-mechanical work, and designed with a view to the most rigid and accurate adjustment of the lens used in conjunction with the prism. The latter is mounted in a stout metal setting, which brings one of the non-reflecting surfaces closely to the front lens of the objective. The hypotenuse surface is silvered, and the prisms themselves prepared from colourless, carefully annealed crown glass. The prices are as follows, including in each case an objective ring fitted with revolving collar and clamp, which allows of the lens being turned on its axis and clamped in any position in which the prism is required.



No.	Length and Breadth of Non-reflecting Surfaces. Ins.	Mm.	PRICE. £	s.	d.
1	1	25	4	10	0
2	1⅜	35	5	10	0
3	1¾	45	7	0	0
4	2	50	9	0	0
5	2⅜	60	12	0	0
6	2¾	70	16	0	0
7	3⅛	80	21	0	0
8	3½	90	30	0	0

Also for the purposes of the process three-colour worker Messrs. Ross are issuing sets of three-colour filters in optically worked glass, the red passing rays from 644 to 590, the green from 600 to 480, and the blue from 490 to 360. The filters are issued in sets of three in sizes from 2½ ins. square (price £4 13s. 6d.) to 5 ins square (price £18 10s.).

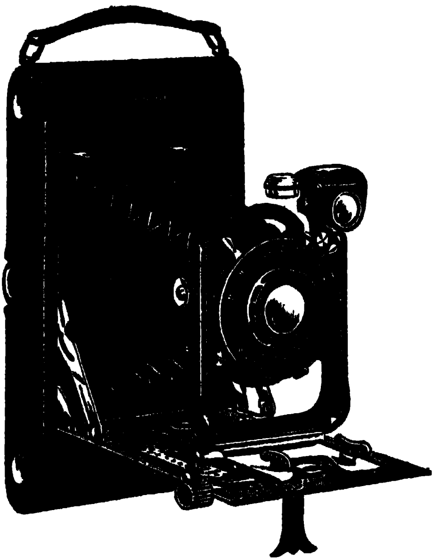
"CARBINE" ROLL FILM OR PLATE CAMERAS.

(Sold by W. Butcher and Sons, Limited, Camera House, Farringdon Avenue, London.)

Three new models of this popular type of camera, for use with either plates or films, are the Nos. 0, 4A, and 5 "Carbine." The No. 0 is issued at the price of £1 12s. 6d. in quarter-plate size, focusses by pushing the front along its runners, has rise of front, reversible brilliant finder, single lens with diaphragms from *f*/11 to

f/45, and shutter (the "Lukos") giving one instantaneous speed and bulb and time The focussing scale serves for both plates and films being placed in one position or the other on a pair of studs, so that the same infinity catch serves in both cases. A camera which is very moderately priced for the movements supplied

In the No 4A, sold at £3 17s 6d, in quarter plate size, with Aldis "Uno" anastigmat f/7 7, a very substantial and well fitted folding camera is provided The front is of U form, in one piece, and very rigid, allowing of about ¾ in rise and the same amount of



No 4a "Carbine

fall The shutter is the Bausch and Lomb "Automat," there is reversible brilliant finder and level, and a very convenient focussing scale, which again is used both for plates and films, for each of which the same infinity catch is employed Another good feature is the spool holder, which takes right out of the camera and is re inserted with the spool fixed The camera is made also in the post card size, price £4 17s 6d, which, as in the case of the quarter plate, is for use with film Single metal dark slides are supplied at 1s 6d each, and adapter for film pack at 5s

In the No 5 "Carbine" the features of the No 4A are retained in every instance, but the camera is of double extension, allowing for the use of the single component of the lens, the bellows being fitted with leather loops for holding it in place at the single exten

sion. The lens-front at the full extension is very rigid, and the price of the camera in quarter-plate, with the "Uno" Aldis anastigmat, *f*/7·7, is £4 12s. 6d.; in postcard, £5 15s.

THE NO. 2 "GRANDAC" *F*/10 TELEPHOTO LENS.

(Made by J. H. Dallmeyer, Ltd., Denzil Road, Neasden, London, N.W.)

This further addition to the series of Dallmeyer telephotos is a special combination of a negative element in conjunction with a positive of 10 ins. focal length and *f*/4 aperture. This latter can if desired, be used alone, and has the usual Dallmeyer fitting for obtaining softness of diffusion at will. The complete objective is fitted with rack and pinion for greater or less separation of the negative element, the whole mounting measuring 9 ins. by 3 ins., with supporting flange of outside diameter 4¼ ins. The negative element projects 1¼ ins. behind the flange. With a 9-in. camera extension the lens gives an equivalent focal length of 28 ins., and works at an aperture of *f*/11. Its power can be raised so that at 12 ins. extension the focal length is 34 ins. and the aperture *f*/14, whilst at 20 ins. extension the aperture is *f*/20 and the focal length 50 ins.

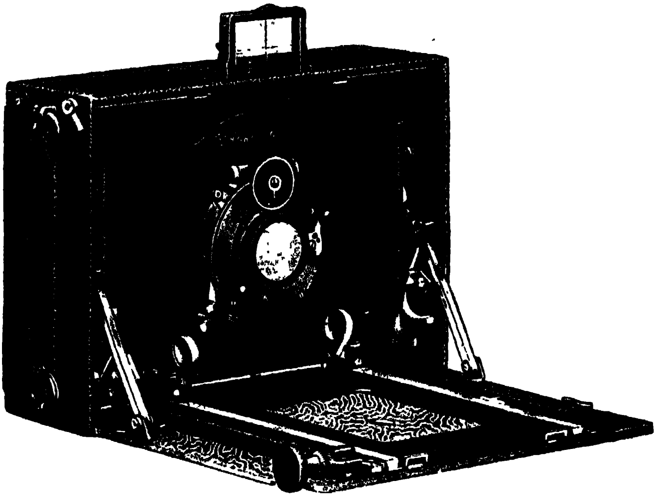
THE VOIGTLANDER "ALPINE" PANORAM AND STEREOSCOPIC CAMERA.

(Made by Voigtländer and Sohn, 12, Charterhouse Street, London, E.C.)

Among hand-cameras of the kind which can be used on a stand and which, also, are of the highest class of construction, this "Alpine" instrument of Messrs. Voigtländer takes a high place. In a previous "Almanac" we were able to write in appreciative terms of the original quarter-plate model, which has now been supplemented by the camera before us, taking plates of the 10 by 15 cm. size, that is, the English 5½ by 3½, or postcard plate. In this size the camera allows of a picture the full size of the postcard photograph being made, whilst, as supplied by Messrs. Voigtländer, it is also available for stereoscopic work.

The makers have kept prominent before themselves the needs of photographers desiring a camera which can be taken to any part of the world; the "Alpine" is constructed throughout of light metal, and is supplied either covered in black leather, whilst for specially trying climates the leather covering is dispensed with and the metal given a high enamel finish. Thus, with the exception of the bellows and the hood of the focussing-screen, there is no part of the instrument which can be readily damaged by extremes of climate or attacks of insects, such as constitute a source of trouble in the case of wooden cameras. As in all the productions of the Brunswick factory, the mechanical work is of the highest description. The lens front draws out on a pair of smooth metal runners and automatically clamps itself at any point, being then moved forward by a very smooth-working rack and pinion to a total extension of 10½ ins. from plate to lens diaphragm. Constructed for use with a "Collinear" anastigmat of 6 ins. focal length, it thus allows also of the use of the Voigtländer telephoto attach-

ment, whilst the lens front can be clamped quite close to the back when using the stereoscopic pair of lenses, each of 3½ ins. focal length. The front allows of nearly one inch rise, whilst the bellows are provided with metal loops for use with the camera at short-focus; also with the necessary stereoscopic partition. The arrangement for removing the lens panel and replacing it by the second panel fitted with a pair of stereo lenses is very expeditious in action, the change from stereo to full-plate picture being made in a few seconds. In short, for those who wish for a camera which



they may take anywhere and feel certain that it will be in working order, a better instrument than the "Alpine" cannot be named. Complete with the Series III. "Collinear," "Koilos," or "Compound" shutter and six single metal slides, the price is £17 10s.; with two series III. "Collinears" of 3½ ins. focal length, each in "Koilos" or "Compound" shutter, £21 10s.; or with both outfits of lenses and shutters, £29 10s. The telephoto attachment, giving a 2½ times magnification, and attached inside the camera without disturbing the lens on the front, is £3 10s.

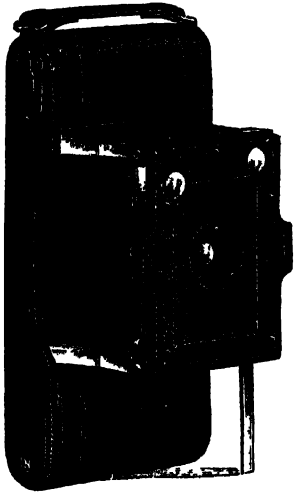
FOLDING "ENSIGN" FILM CAMERAS.

(Made by Houghtons, Limited, 88 and 89, High Holborn, London, W.C.)

A companion series of cameras to the box-form "Ensigns" for film referred to in another paragraph are the series of folding "Ensigns" which provide also for the use of roll-film, and, like the box cameras, are the product of Messrs. Houghtons' works. Like the box-form cameras, too, the build is solid and substantial, and the cameras are, most of them, fitted with the modern accessories

which are considered indispensable in a film camera, such as the adjustable infinity catch by which the lens can be set in focus on any given distance, and on the camera being opened again is automatically stopped at this focus. This is a most practical movement for the hand-camera worker, as it enables him to keep the lens set at a given focus suitable to his work, such as 15ft., when doing figure studies.

The 2¼b pocket "Ensign," taking pictures 2¼ins. by 3¼ins., is the smallest of the series, and is priced at 25s., which includes single lens, three stops, "everset" time and instantaneous shutter, and two view-finders. The 2½ camera is of distinct type, being

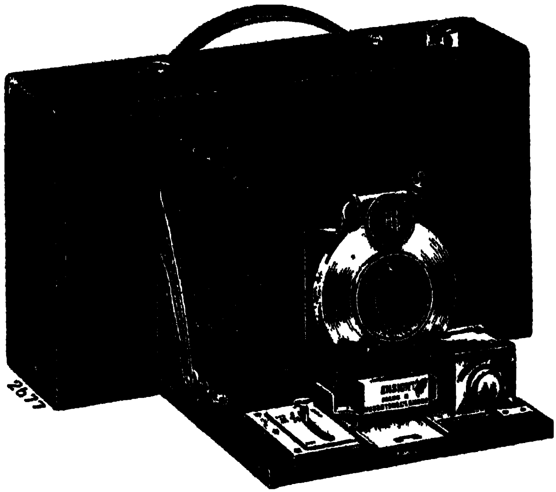


built with the folding baseboard, as shown in the figure This takes pictures 2½ by 4¼, and the lens is fitted with shutter for time, bulb, and instantaneous exposures. There is brilliant reversible finder, the adjustable infinity catch, and bushes for attachment to the tripod. The price of this is 37s. 6d , or 42s. with R.R. lens. In general construction the 3¼a is similar; the price with single lens is 42s.

The 3¼ folding "Ensign" is built landscape way, but otherwise is equipped in the same manner as the 2½ and 3¼a, the size of picture is quarter-plate, and the price with single lens 37s. 6d. As we said in reference to the box-form film cameras, the workmanship and fittings throughout the series are remarkably good. We are glad to see Messrs Houghtons refusing to overload their cameras with a multiplicity of fittings which serve no useful purpose. All these new film cameras of theirs are thoroughly good

from the practical standpoint, and on that ground will appeal, we believe, to the Colonial buyer and user

The above do not, of course, exhaust the folding film cameras of Messrs Houghtons, two further models of which deserve to be



mentioned These are the "Standard Ensign," quarter plate and postcard, the notable feature of which is the provision, in addition to all the usual fittings of an anastigmat lens working at f/6 8 Although thus qualified for turning out the best class of work as regards definition the price of these cameras is that usually charged for similar instruments fitted with R R lens—namely, £3 12s 6d for the quarter plate and £4 12s 6d for the postcard

GOERZ VEST POCKET "TENAX" AND ACCESSORIES

Made by the C P Goerz Optical Works Limited, 1 to 6, Holborn Circus, London E C)

This beautifully made pocket camera is now issued with the Goerz "Syntor" lens at the price of £7 10s complete, with six single metal slides and two flexible purses Except as regards the lens, the camera is identical with the original model issued with the Goerz "Dagor," and too high praise cannot be accorded to the mechanical perfection of both camera and slides Messrs Goerz also supply a tropical model of the Vest Pocket "Tenax," in which brass or bronze is used throughout in place of steel, the covering being Russia leather This model is supplied only with the "Dagor" at the price of £10 10s, inclusive of six slides.

For use with the Vest Pocket "Tenax" the makers have placed on the market an excellent developing tank holding twelve plates,

placed back to back in six grooves, at a price of 8s. 6d., whilst for washing the "Tenax" negatives a tank and rack of somewhat slighter build, and holding twenty-four negatives placed in pairs back to back, is supplied at 2s. Both accessories are of high finish. A further accessory for the benefit of users of this camera is a daylight enlarger allowing of prints up to quarter-plate, postcard, and 7 by 5 being made. The enlarger consists of a body holding the bromide paper into which slides the portion carrying the lens. It is adjusted by marks outside, so that the several degrees of enlargement are obtained without focussing. The price is £2.

A new series of glass light-filters is also a new introduction of Messrs. Goerz, manufactured to fit the lens of the Vest-Pocket "Tenax," as well as others up to a diameter of 2¼in. The filters are made of special Jena glass, are accurately ground and polished, and are supplied mounted in threaded cells, which screw into the front combination of the lens. The filters are supplied in light, medium, and dark tint, the first-named increasing exposure about twice, the second from 3 to 3½ times, and the deepest from five to six times. These figure are, of course, approximate, as different ortho' plates will require a greater or less exposure factor. For lenses with hoods up to 1⅛in. diameter the price of each filter is 12s.; from 1⅛ to 1⅜, 19s.; and from this latter size to 2¼in., 26s. 6d.

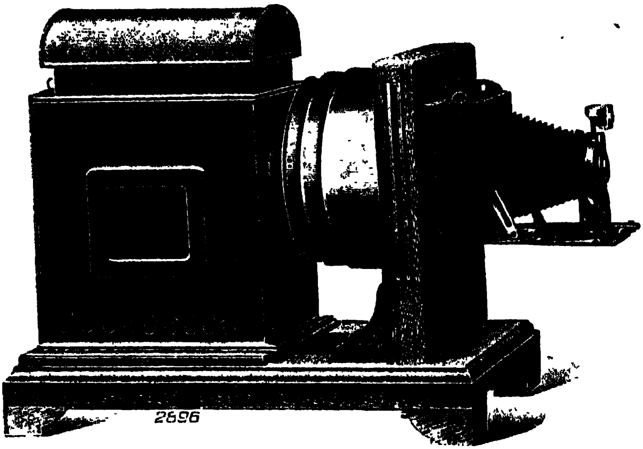
"ENSIGN" ENLARGERS.

(Made by Houghtons, Ltd., 88 and 89, High Holborn, London, W.C.)

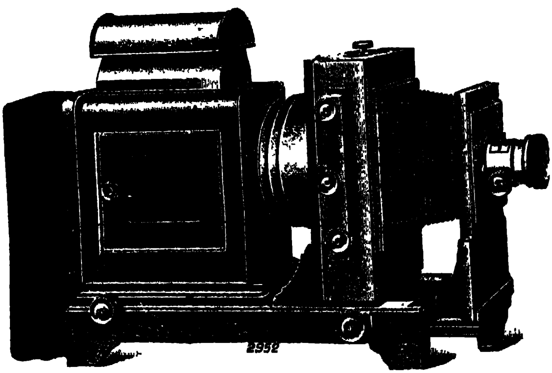
Messrs. Houghtons, with whom enlarging apparatus has long been a specialty, have prepared a whole series of new models for the 1910-11 season. In noticing these we must be content with pointing out the general features, and instancing one or two models in order to show the remarkably moderate prices at which the instruments are supplied. In every case the lantern is built on a base mounted on four feet, so that it rests firmly on the table, whilst in the "Grosvenor" pattern, mentioned below, and also in the "Princess," the lens front has a special foot, which supports it rigidly at the full extension. The stout angle pieces, which stay the upright portions of the enlarger, and ensure the correct alignment of the optical system, are a special feature. The negative carrier, according to the price of the enlarger, is fitted with tilting, rotating, up and down, or sideway movement, slight adjustment of the projection lens is provided, whilst the lantern body moves either by ordinary sliding friction or by winch screw. The condenser is connected with the negative stage by triple telescopic tube, and the whole design and construction of the enlargers are excellent throughout.

To instance one of the most complete instruments, the "Grosvenor," the illustration shows the rising and falling, rotating and cross adjustments. The milled head above the negative stage actuates the tilting movement. The lantern body has rack and pinion adjustment, whilst for focussing a head is provided on

either side of the lantern. In the quarter-plate size, complete with 5½-in. condenser and with portrait lens, the price is £5 15s.; without lens, £4 15s. In the half-plate size (8½-in. condenser) these prices are £9 10s. and £7 15s.



The "Combination" enlarger is a cheaper type of instrument with which the photographer can use his own camera, such as the

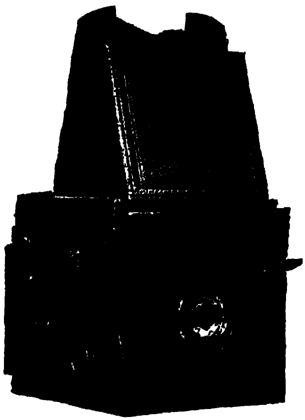


folding "Klito," "Tudor," or "Ensign." The illustration shows the instrument, the price of which in the quarter-plate size is £2, or in half-plate, £4.

THE "CHALLENGE" MINIATURE REFLEX CAMERA.

(Made by J. Lizars, 101 and 107, Buchanan Street, Glasgow.)

In this last addition to the "Challenge" series of reflector cameras, noticed in previous "Almanacs," the makers have provided an



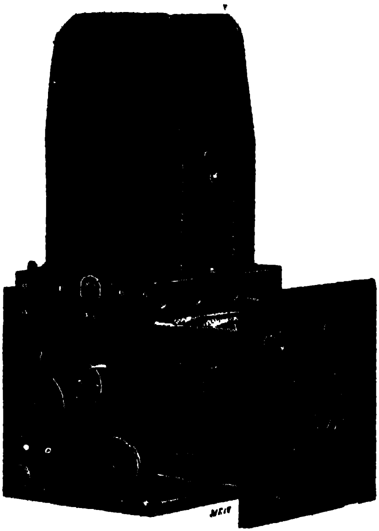
instrument of the 3½ by 2½ size possessing the ordinary movements of the larger sizes, such as rotating back, rising front (½ in.), deeply recessed lens chamber, and extension of 7¾ ins. The camera allows of the use of a focus of 4½ ins., and is fitted with the "Challenge" focal-plane shutter. Lightly, but strongly, built, the outside dimensions of the instrument are 6 by 6 by 5¼ ins. The price, with Aldis Series II. anastigmat and three double dark slides, is £13 5s. The camera is also made of oblong pattern, and thus of somewhat smaller dimensions, the price in this style being £11 15s.

THE "IDEAL" REFLEX CAMERA.

(Sold by O. Sichel and Co., 52, Bunhill Row, London, E.C.)

Messrs. Sichel have sent us for purposes of review an example of the half-plate size of this new reflex camera which they are just introducing. In a number of respects it is quite distinct from instruments of the same type which they have hitherto placed upon the market. To begin with, the mirror is of the spring-actuated type, the slightest pressure upon the release causing it to rise and the shutter, immediately afterwards, to expose the plate. This, as we have often pointed out several times, is a type of construction which is preferable on the whole to that in which the trigger release must first be pressed downwards through quite a distance (thereby raising the mirror) before the shutter is released. True, the mirror,

in this latter type, falls automatically after the exposure, but the longer interval which elapses between pressing the release and the shutter being raised is a drawback in rapid work. A further good feature of the present instrument is the hinged frame of the hood, which can be immediately turned back, giving access to the ground glass. The hood is built square, with springs inside,



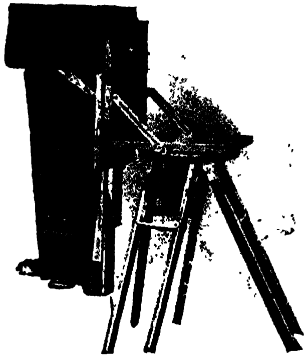
holding it firmly erect. In the half-plate instrument there is a rise of front of 1 in. and about ½ in. fall. The extension is 16 ins., but a further 2 ins. can be obtained by reversing the recessed lens panel. In the matter of focal-plane shutter, rotating back, and smoothness and silence of the mirror and shutter mechanism, the camera is very well provided, and is an instrument, at a moderate price, excellently adapted for general Press photography. Complete with three slides, but without lens, the price is £16. With "Bifocal" Fulmenar lens, £23 10s. or with Series I. "Fulmenar" $f/6.8$, 9½ ins. focus, £22 10s.

THE TILTING TRIPOD TOP.

(Made by Kodak, Limited, 57 to 61, Clerkenwell Road, London, E.C.)

This is a useful little accessory for carrying light cameras, such as the Kodaks, Brownies, etc., in such a way that they can be tilted at any angle or even pointed vertically downwards or upwards. The accessory measures 5½ by 5 ins. over all, and though weighing

only a few ounces is most strongly made with brass piano hinge. The slotted side-struts provide an automatic stop for the right-angle



position. The price of this accessory is 13s. with top 5 by 4 ins.; 15s. with top 7 by 5 ins.

THE "TOURIST" DEVELOPING TANK.

(Sold by John J. Griffin and Sons, Limited, Kingsway, London, W.C.)

This excellent developing tank, the first models of which we have already noticed, is now made in half-plate size for professional use, and is fitted with the conveniences now recognised as essential for

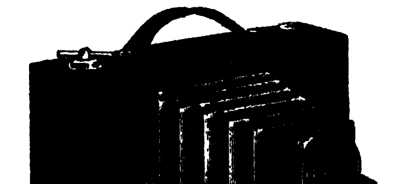
satisfactory tank development—namely, hermetical sealing of the tank, so that the latter can be inverted from time to time during development, uniform distribution of the developing solution when

the latter is poured in, in addition to rapid loading of the plates in the rack. This latter is such that plates can be inserted in absolute darkness, whilst with plates of the thinness of glass which is fairly common nowadays two plates may be inserted in each groove and twenty-four thus developed in the twelve-groove tank. In doing this the plates are inserted back to back, and are thus quickly transferred from the popular block form of dark-slide, it being only necessary to separate them slightly so as to allow the dividing card to drop out. Thus in the dark room there is no laying down of one plate while the other is being inserted in the tank. In this professional size the price of the tank is 21s., taking twelve half-plates singly, or twenty-four back to back. In addition to the ordinary tap for withdrawing the developer or fixer, it is provided with syphon and separate tap for keeping the tank full during washing.

THE 2A. FOLDING POCKET "BROWNIE."

(Made by Kodak, Limited, 57 to 61, Clerkenwell Road, London, E.C.)

This addition to the "Brownie" series of cameras is for pictures $2\frac{1}{2}$ by $4\frac{1}{4}$, the camera measuring outside $8\frac{1}{2}$ by $3\frac{1}{2}$ by 2 ins. The camera is fitted with single lens, automatic shutter, giving bulb and time exposures, and one instantaneous speed. It is fitted with the automatic focussing lock, which can be set for objects 8, 25, and



100 ft. from the camera, the lens front being pulled out to the full, and automatically coming into the position of focus for one or other of these distances according to the setting of the lock. Complete with reversible finder, this very neat roll-film camera is sold at 30s.

FOLDING "KLITO" CAMERAS.

(Made by Houghtons, Limited, 88 and 89, High Holborn, London, W.C.)

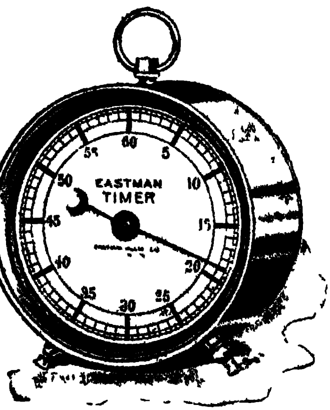
In the two new models of cameras, the No. 6 (postcard) and the half-plate folding "Klito," the makers have provided a type of instrument midway between the familiar folding pocket camera for plates with moderate range of movements and the more elaborate hand-stand cameras, such as the "Sanderson." Thus each camera

is of stouter build, greater extension, and more ample rise of front than one can usually get in the ordinary folding plate cameras. Yet the instrument is complete and self contained, though still highly portable. There are many people who, on account of choice or exigency of cost, will welcome this compromise, which we would say is presented in very practical shape in the two instruments In both there is provided double extension, focussing scale, hooded focussing screen, rising front, and cross front movement, and bushes for attachment either way to the tripod The shutter fitted is either the Ensign "Sector" or the B. and L. "Automat," either giving range of instantaneous speeds, as well as time exposures. Reversible brilliant finder and double dark slide of solid pattern complete an outfit which is very efficient, both for hand or stand use. The price of the No 6, complete with Beck R R $f/8$, Ensign "Sector" shutter, and one dark slide, is £3 10s ; or with the Ensign anastigmat of $f/6$ 8 aperture, £4 15s In the case of the half plate these prices are £4 5s and £5 15s respectively

THE EASTMAN TIMER

(Made by Kodak, Limited, 57 to 61, Clerkenwell Road, London, E C)

While more or less elaborate clocks for the use of photographers have been put upon the market, extreme simplicity is the chief requirement in the dark room, and therefore this simple instrument will be found of great service in giving exposures noting the time

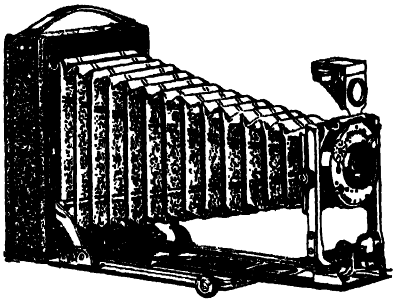


of development, etc It is simply a clock dial 3½ ins. in diameter, and divided into sixty seconds and half-seconds. The finger makes the tour of the dial in one minute, and the plainness of the gradation in conjunction with the size of the dial allows of quite short exposures being accurately timed. The clock has one adjustment only, namely, a slow and fast lever, to enable its motion to be regulated. The price is 8s.

THE "RADIA" FOLDING CAMERA.

(Sold by Voigtländer and Sohn, 12, Charterhouse Street, London, E.C.).

In this compact model of the folding hand-stand camera the feature is the very rigid U-form front with rising and cross movement, in both cases by rack and pinion. The shutter is the "Compound" fitted with the Voigtländer $f/6.8$ "Radia" anastigmat of



5¼-ins. focus. The camera is for 9 by 12 cm. or quarter-plate, and is of double extension, allowing 12 ins. from lens diaphragm to plate. Constructed throughout of light metal, it is exceedingly well made and is a high class instrument of this type. Complete with three single metal dark-slides and the lens mentioned above, the price is £7 5s. The camera is suited for use with a film pack, the holder for which is supplied at an extra cost of 7s. 6d.

THE "KLIMAX" DEVELOPING TANK.

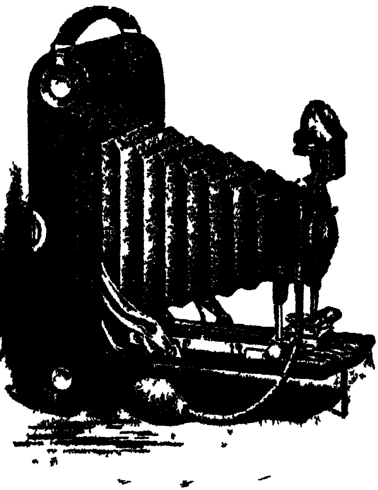
(Sold by W. Butcher and Sons, Ltd., Camera House, Farringdon Avenue, London.

This developing tank excellently fulfils the two chief conditions for tank development, that is to say, the plates are readily inserted in the rack and the lid of the tank closes watertight so that the tank can be inverted once or twice during development, thus avoiding markings which are apt to occur if the developer remains still. The rack takes six plates, which are inserted in pairs, back to back, in wide grooves. A sliding piece on one side of the rack locks the plates safely in the rack, so that on the completion of development—or, of fixing, if this is done in the tank—the plates can be freely rinsed in a bucket of water before being set to wash. The tank itself may be used as a washer, since it is provided with outlet cock in addition to the screw plug for the admission of developer. The tank is very well made in nickel brass, the device for the admission of developer in daylight is excellent, and the arrangement of the plates in the rack ensures the maximum contact with the bulk of the developer. In quarter-plate size the price is 7s. 6d.; in postcard, 5½ by 3½, 10s. 6d.; in 5 by 4, 10s. 6d.; and in half-plate or stereoscopic, 6¾ by 3¼, 12s. 6d.

THE NO 3A SPECIAL KODAK

(Made by Kodak Limited 57 to 61 Clerkenwell Road London, E C)

This roll-film folding pocket camera for postcard pictures (3¼ by 5½) is of the general pattern of the F.P K. instruments, but includes movements such as screw rise and fall of front, and is fitted with



the convenient Compound shutter The instrument before us carries the Cooke Series IIIA anastigmat of 6⅞ ins focus and working at *f*/6 5 Complete with reversible brilliant finder and level, rack and pinion focussing, two bushes for attachment to tripod, the price is £11. With Zeiss "Tessar," *f*/7, £12 18s 6d

COOKE 100 PER CENT EXTENSION LENSES

(Made by Taylor, Taylor and Hobson Limited, Stoughton Street, Leicester)

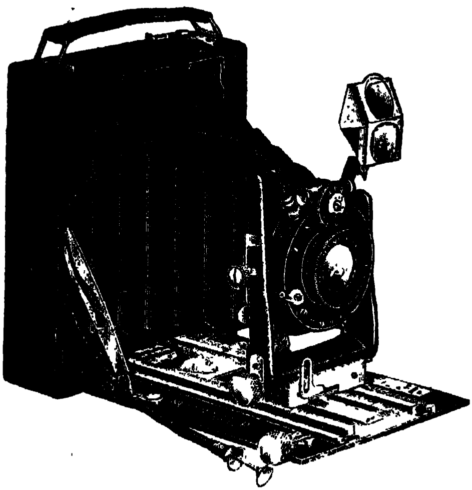
The Cooke series of extension lenses has been added to by a set, described as "100 per cent extension lenses," which double the focal length of the objective with which they are used, the original 50 per cent lenses only increasing the focal length by one-half These extension lenses can be supplied for use with any of the series II , III , IV , or V. objectives, being substituted for the back combination in the last three series, and used in the place of the front combination in Series II With the extension lens in place the objective forms a narrow angle combination, as it is not intended to cover a larger plate than that covered by the objective in its normal condition. The result is, therefore, not the same as

that obtainable with a normal Cooke doublet of twice the focal length. The long-focus narrow-angle combination is, however, eminently useful, and the extension lenses, which are of very moderate prices, provide a simple means of obtaining it.

THE "WESTMINSTER" FOLDING CAMERAS.

(Sold by the Westminster Photographic Exchange, Ltd., 119, Victoria Street, London, S.W.)

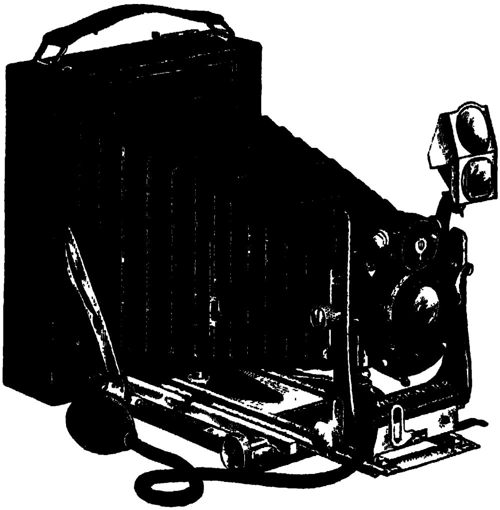
Two very superior models of the popular folding pocket plate camera are specialties of the Westminster Company, by whom they are issued with an evident regard for the requirements of the amateur worker. The single-extension model is issued in the quarter-plate size at £3 5s., complete with three single metal slides and hooded focussing screen. The body is of ebonised wood



covered in fine-grain black leather with aluminium baseboard of enamelled black finish. A most rigid U-form lens-front is fitted provided with rise and fall and cross movement, in each case actuated by rack and pinion. The shutter is the "Ibso" for time, bulb and instantaneous exposures, and the camera carries reversible brilliant finder and level. The lens is an $f/8$ "aplanat." The camera is highly compact, measuring, when closed, 5⅝ by 4½ by 1½ ins. in the quarter-plate size.

In the double-extension pattern the camera racks out to 9 ins. in the quarter-plate, or 12½ ins. in the postcard size, and in addition to the fittings already mentioned carries a focussing scale for the single half of the lens and a pair of clips for holding the

bellows forward at the single extension. Although allowing of the use of the half-lens as a long focus, the dimensions of the



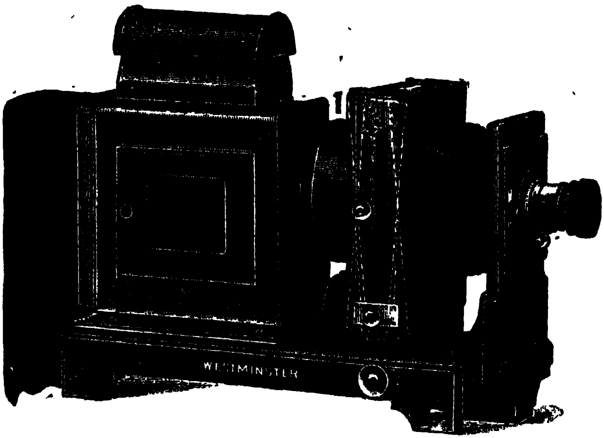
camera when closed are the same as those of the single extension, and the weight very little more. The prices, with $f/8$ "aplanat," three single metal slides, and hooded focussing screen in wallet, are :—Quarter-plate, £4; postcard, £4 10s.

THE "WESTMINSTER" ENLARGER.

(Sold by the Westminster Photographic Exchange, Ltd., 119, Victoria Street, London, S.W.).

In this enlarging lantern the usual form of construction is followed, but in a number of minor details the care of the makers to ensure convenient working is prominently shown. Thus, the lantern body is fitted with a ruby window, 4½ by 3½ ins., giving a convenient amount of light in the enlarging room. Perfect trapping of light from the back of the lantern is secured by an ample curtain mounted on a stout wire frame. The condenser is instantly removable by sliding back the lantern body, whilst the telescopic tube, connecting the condenser with the lantern, likewise comes away like the lens-panel of a camera. The stage provides a rotating movement, and also tilting of the negative, both of which adjustments are actuated by rack and pinion. In the matter of extension the enlarger is well provided, the quarter-plate instrument giving 16½ ins. from negative to lens-flange, and thus allowing of the enlarger being conveniently used for making lantern slides by reduction. We may say a good word, too, for the excel

lence of the rack and pinion movement which works with great smoothness and absence of back-lash. The lens-panel can be raised and lowered a little—much movement is wrong both in principle and practice—and the whole enlarger is one which the amateur worker can obtain with every confidence as to its satisfactory use.



In quarter-plate size, with 5½-in. condenser but without lens, the price is £3 3s.; for 5 by 4 or postcard (6½-in. condenser), £3 17s. 6d.; in half-plate (8½-in. condenser), £5. Suitable achromatic lenses fitted with rack and pinion and yellow cap are supplied for these enlargers at the prices of 15s., 20s., and 25s. respectively.

THE "N. AND G." FOLDING LENS-HOOD.

(Made by Newman and Guardia, Ltd., 17 and 18, Rathbone Place, London, W.)

A hood shade for the lens is supplied by Messrs. Newman and Guardia in extremely light form, consisting of a collapsible hood of the material used in making the blinds of focal-plane shutters, which is supported on a light framework mounted in turn on a wooden holder. The latter is pierced to fit the lens hood or to be attached to the front of the camera. The hood is made in two sizes, the smaller for lens hoods of diameter up to 2 ins., price 7s. 6d., and the larger for those up to 2½ ins., price 10s. 6d.

[*The separate items in the foregoing "Novelties in Apparatus" section are Indexed in the General Index to the Text portion of the "Almanac," placed at the end of the volume.*]

FORMULÆ FOR THE PRINCIPAL PHOTOGRAPHIC PROCESSES.

ORTHOCHROMATIC PROCESSES.

(Most of the formulæ in this section are those used in the three colour and process department of the L C C School of Photo Engraving, Bolt Court, London, E C, to the Principal of which Mr A J Newton, we are indebted for assistance in arranging them in the present form —Ed *B J A*)

Sensitisers for Gelatine Plates.

1 —*For blue green and green*

To sensitise up to wave lengths, 5 500 A U , a good dye is *acridine orange*, *N O* of the Leonhardt Farbwerke, Mulheim, Germany It is used as directed below for green and yellow sensitising, except that ammonia must not be used

The isocyanines mentioned below are also extremely good sensitisers for green and are probably faster, but require suitably adjusted green filters when nothing beyond the green is required

2 —*For green and yellow, but not red*

To sensitise up to 5,900 A U , *erythrosine* is still the best dye, though it leaves the plates somewhat insensitive to bluish green The most suitable dye is that of Dr. Schuchardt, Goerlitz, or of Meister Lucius and Bruning, Hoeschst, a/M

One part of dye is dissolved in 1,000 parts of alcohol, and a bathing solution made as follows —

Stock solution 1 1,000	100 parts
Water	400 parts
Ammonia (0 880)	5 parts

This is a 1 5,000 solution

N B —Ammonia must not be used with acridine orange

3.—*Green, yellow and red.*

To sensitise for all rays up to 6,200 to 6,400 A.U. the following are used:—

Orthochrome T, Pinaverdol, Pinachrome, or Homocol,

their order as red sensitisers being as above.

A stock solution is made containing 1 part of the dye in 1,000 parts alcohol. The bathing solution contains:—

Stock solution	2 parts
Water	100 parts

This is a 1 : 50,000 solution.

The stock solution will keep, but the weaker bath will not. A red light is used, until it is seen that the solution has covered the plates, after which the operation must be continued in total darkness.

4.—*Extreme visible red.*

To sensitise for the extreme visible red, *pinacyanol* should be used. The operations can be done in a weak green light, passing the part of the spectrum between 5,000 and 5,300. The dye solutions are prepared exactly as those of Orthochrome T, etc. See above.

5.—*Panchromatic Plates.*

Use a 1-50,000 solution of a mixture of pinachrome and pinacyanol, viz., 3 parts pinachrome stock solution, 2 parts pinacyanol stock solution; water, 250 parts.

6.—*Infra red.*

The best sensitiser for the infra red is *dicyanine*, which is prepared and used exactly as pinacyanol, except that the stock solution must not be added to the water until the very last moment, when everything is quite ready, and the plate can be immediately flowed with the solution, as the weak solution loses its sensitising power very quickly.

If ammonia is used with the cyanine sensitisers given in 3, 4, and 5, it must be quite pure, or fog will be produced. It is best to dispense with it, but if used the proportion is about 1 part per 100 of sensitising bath.

Practical Notes on Bathing.

The dye solution is prepared in a measure, the plates are dusted and laid in a flat porcelain dish, which is large enough to hold nearly twice the number of plates it is desired to sensitise at one time. These are put at one end of the dish; the dish is then tilted, and the dye solution poured into the other (empty) end, then the dish is tilted back, so that the dye solution sweeps over the plates in one even flow free from air bells. The dish is now gently rocked for three minutes, then the plates are removed and washed in a good stream of running water for at least another three minutes. Their sensitiveness will probably be somewhat greater if they are washed for ten minutes. They will remain good for months, kept under proper conditions, after three minutes' thorough washing, if bathed according to the formulæ given above.

The water tap should be fitted with one of the small anti-splash filters, the fine wire gauze in which retains any solid particles that may be in the water.

After washing, the plate should be well swabbed with a wad of cotton wool, and then placed in a drying cupboard. The quicker drying takes place the better, so that if a current of warmed, filtered air, free from fumes, can be sent through the cupboard it is an advantage, though the absence of this convenience need not deter anyone from sensitising plates. Drying can be hastened by placing a dish of dry calcium chloride or quicklime at the top of the cupboard.

Sensitisers for Collodion Emulsion.

For Green and Greenish Yellow (Hübl).

Pinaverdol (1 : 500)	1 oz.	40 c.c.s.
Collodion emulsion	25 ozs.	1,000 c.c.s.

The sensitiveness extends from the orange to the violet.

Panchromatic Sensitisers (Hübl).

Pinaverdol (1 : 500)	3 ozs.	30 c.c.s.
Ethyl violet (1 : 500)	½ oz.	5 c.c.s.
Collodion emulsion	100 ozs.	1,000 c.c.s.

Pinacyanol can be substituted for ethyl violet.

For Red Sensitising.

Pinacyanol (1-1,000)	.. ..	3 ozs.	3 c.c.s.
Collodion emulsion	.. ..	100 ozs.	100 c.c.

For Blue and (slightly) Blue-green Sensitiveness.

The following sensitiser increases the sensitiveness of the collodion for ordinary work :—

Canary II. (sat. sol.) (Reade Holliday, Huddersfield)	..	1 oz.	10 c.c.s.
Emulsion	..	10 ozs.	100 c.c.s.

The dyed emulsion keeps well, and in half-tone work gives a sharp clean dot, but its speed is not improved.

Safe-lights for Developing.

(Newton & Bull.)

Yellow safe light for wet plates, bromide papers.

	Per sq. cm.	Grs. per sq. in. (approx.)
Tartrazine	1 mgm.	$\frac{1}{10}$
Or brilliant yellow	0·5 mgm.	$\frac{1}{20}$
Or naphthol yellow	1 mgm.	$\frac{1}{10}$
Or auramine	2 mgm.	$\frac{1}{5}$

Red safe light for ordinary plates.

	Per sq. cm.	Grs. per sq. in. (approx.)
Tartrazine	1 mgm.	$\frac{1}{10}$
Rose bengal (or fast red) ..	0·5 mgm.	$\frac{1}{20}$

Safe light for Ortho plates.

The above screen is combined with one containing—

Methyl violet	0·5 mgm.	$\frac{1}{20}$

The red screen transmits light from the end of the visible red about λ 7,000 to λ 5,900 in the yellow. The methyl violet absorbs from λ 6,500 to λ 5,000, so that the only light passing the two is the extreme red of λ 7,000 to λ 6,500.

The dyes are dissolved in gelatine solution, which in winter should be about 8 per cent. in strength and about 10 per cent. in summer. About 20 c.c.s. should be allowed for every 100 sq cm. of glass, *i.e.*, about 20 minims per sq in. The dyes are added, most conveniently from stock solutions, in quantity to give the proportions stated above in the filters.

DEVELOPERS AND DEVELOPMENT.

(*Arranged alphabetically*)

The following are a few of the typical formulæ generally employed for development, etc. A much greater variety will be found in the section headed "Developing Formulæ of the Principal Plate-makers" pp. 788, &c). In these as in other formulæ in the ALMANAC "sodium sulphite" without qualification refers to the "cryst" and "recryst" sulphite, and "sodium carbonate" to the crystallised carbonate.

It should be noted also that the metric weights are not equivalents of the British item for item, but that the two formulæ give a solution of the same composition.

Adurol.

TWO SOLUTION.

A.—	Adurol	85 grs	19·5 gms.
	Sodium sulphite	1¾ oz	175 gms.
	Water	10 ozs.	1,000 c c.s
B.	Potass carbonate	1¼ oz	125 gms
	Water	10 ozs	1,000 c c.s.

Adurol possesses a character intermediate between pyro and the long-factor developers, metol, amidol, etc

For studio work and snap-shots take 1 part of A, 1 part of B.
For time exposures outdoor take 1 part of A, 1 part of B; 1 part of water.

ONE-SOLUTION (CONCENTRATED).

Sodium sulphite	4 ozs.	400 gms.
Potass. carbonate	3 ozs.	300 gms.
Water	10 ozs.	1,000 c.c.s.

When all are dissolved add :—

Adurol	½ oz.	50 gms.

For studio work and snap-shots take 1 part with 3 parts of water.
For time exposures outdoor take 1 part with 5 parts of water.

Amidol.

(Diamidophenol.)

A normal developer consists of :—

Amidol	2—3 grs.	4·5—7·0 gms.
Sodium sulphite	25 grs.	57·5 gms.
Water to	1 oz.	1,000 c.c.s.

The mixed developer will keep well in solution for about a week, or sometimes longer, if it is made *not stronger* than given above. It must be made up with freshly dissolved sulphite, as this salt does not keep well in solution for more than a few weeks. A sodium sulphite solution that has had added to it some potassium metabisulphite will, however, keep well for a very long period, and by the addition of dry amidol a fresh developer can be rapidly prepared when required. Make the following stock neutralised sulphite solution :—

NEUTRAL STOCK SULPHITE.

Sodium sulphite	4 ozs.	200 gms.
Potassium metabisulphite ..	½ oz.	25 gms.
Water to	20 ozs.	1,000 c.c.s.

DEVELOPER.

Amidol	40—60 grs.	2—3 grs.	4.5—7·0 gms.
Stock sulphite sol.	4 oz.	100 minims	200 c.c.s.
Water to	20 oz.	1 oz.	1,000 c.c.s.

Azol.

The following are the instructions for the use of this single solution developer.—

For Plates and Films.—

Normal exposures.	Azol	20 mins.	¼ oz.
	Water.. ..	to 1 oz.	to 6 ozs.
Under-exposures	Azol	15 mins	¼ oz.
	Water.. ..	to 1 oz.	to 8 ozs.
Over-exposures:	Azol	30 mins.	¼ oz.
	Water.. ..	to 1 oz.	to 4 ozs.

For stand development:—Azol, 1 oz.; water, 100 ozs.

For tank development:—Azol, ¾ oz; water, 40 ozs. Time of development of films at 60 deg. F, 20 to 30 minutes. This solution may be used several times in succession.

For lantern slides and transparencies —Azol, 25 mins.; potass. bromide 10%, 5 mins., water to 1 oz.

For bromide papers:—Azol, 15 mins.; water to 1 oz. A few drops of 10% solution potass. bromide may be added if the whites are grey.

For gaslight papers:—Azol, 40 mins.: water to 1 oz. Add a few drops of 10% solution of potass. bromide, sufficient to keep the whites clear

Diamidophenol.

See Amidol.

Edinol.

ONE-SOLUTION.

For soft portrait negatives

Sodium sulphite	5 ozs	250 gms
Edinol	100 grs.	11 gms.
Sodium carbonate..	2 ozs.	100 gms.
Water	20 ozs.	1,000 c.c.s.

For contrasty negatives.

Acetone sulphite (Bayer)	..	288 grs.	33 gms.
Sodium sulphite ..	.. ..	4 ozs.	200 gms.
Edinol	.. ..	100 grs.	11 gms.
Potassium carbonate	.. ..	2 ozs.	100 gms.
Potassium bromide	.. ..	50 grs.	5·5 gms.
Water	.. ..	20 ozs.	1,000 c.c.s.

The ingredients should be dissolved strictly in the order given.

Edinol tends to contrast when a carbonate is used: to softness when a caustic alkali is employed. A developer of the latter class contains, in one ounce, edinol, 2½ grs.; caustic soda, 1½ gr.; and sodium sulphite, 10 grs.

Eikonogen.

A.—Sodium sulphite ..	.. ..	2 ozs.	100 gms.
Eikonogen	.. ..	½ oz.	25 gms.
Distilled water ..	.. ..	20 ozs.	1,000 c.c.s.
B.—Potass. carbonate ..	.. ..	1½ oz.	75 gms.
Distilled water ..	.. ..	20 ozs.	1,000 c.c.s.

For use, mix equal volumes of A. and B.

One-Solution.

Sodium sulphite ..	.. ..	2 ozs.	100 gms.
Sodium carbonate	.. ..	1 oz.	50 gms.
Distilled water ..	.. ..	20 ozs.	1,000 c.c.s.
Eikonogen	.. ..	½ oz.	25 gms.

Eikonogen is a good developer for full detail without excessive density in the high-lights.

Eikonogen-Hydroquinone.

A.–	Hydroquinone	40 grs	4 5 gms
	Eikonogen	120 grs	14 gms
	Sodium sulphite	480 grs.	55 gms
	Citric acid .	20 grs	2 3 gms
	Water to .	20 ozs	1,000 c c.s
B –	Potass bromide	5 grs	0 5 gms.
	Sodium carbonate	60 grs	7 gms
	Caustic potash	30 grs	3 5 gms
	Water to	20 ozs	1 000 c c s

For use, mix in equal parts

This developer is suitable for negatives, lantern plates, and bromide papers

Ferrous Oxalate.

A —Potass oxalate (neutral) 5 ozs hot water, 20 ozs Cool, and pour off clear liquid for use

B —Warm water, 20 ozs sulphuric acid, 30 minims, sulphate of iron, 5 ozs

Mix 1 oz of B with 3 to 4 ozs of A (pouring B into A, not *vice versâ*)

A more powerful developer is made by dissolving commercial dry ferrous oxalate in boiling saturated solution of potassium oxalate As much as will dissolve is stirred in and the whole left to cool, after which the clear solution is poured off for use

FOR TRANSPARENCIES ON GELATINO CHLORIDE PLATES

	—Neutral oxalate of potash	2 ozs	100 gms
	Ammonium chloride	40 grs	4 5 gms
	Distilled water	20 ozs	1 000 c c s
B	–Sulphate of iron	4 drs	34 gms
	Citric acid	2 drs	17 gms
	Alum	2 drs	17 gms
	Distilled water	16 ozs.	1 000 c c s

For black tones, mix the above in equal volume

Hurter and Driffield's Standard Ferrous Oxalate Developer.

(*The Photographic Journal*, 1898.)

A.—Potassium oxalate	1 part
Water ..	4 parts
B.—Ferrous sulphate	1 part
Citric acid	0·01 part
Water .	3 parts
C.—Potass. bromide ..	1 part
Water	100 parts

For use take A, 100 parts; B, 25 parts; C, 10 parts. Development to be conducted at a temperature of 65 deg. F.

The ferrous oxalate as compounded above contains in every 1,000 parts:—Potassium oxalate, 185 parts; ferrous sulphate, 68·5 parts; citric acid, 0·61 part; potassium bromide, 0·74 part.

Glycin.

ONE SOLUTION (Hill.)

Boiling water	4 ozs.	1,000 c.c.s.
Sodium sulphite	2½ ozs.	625 gms.
When dissolved add		
Glycin	1 oz.	250 gms.
And then in small quantities		
Potass. carbonate	5 ozs.	1,250 gms.

This forms a thick cream, which must be well shaken and then diluted with water; for normal work dilute 1 oz. with 12 or 15 ozs. of water; for very soft results with 30 ozs. of water.

ONE SOLUTION.

Glycin	1 oz.	33 gms.
Sodium sulphite	2½ ozs.	83 gms.
Potass. carbonate	5 ozs.	166 gms.
Water to	30 ozs.	1,000 c.c.s.

For normal exposures dilute with an equal bulk of water.

Glycin is a slow-acting developer, but perfectly free from stain. It is the best re-agent for "Stand Development" (which see).

Hydroquinone.

ONE-SOLUTION.

Hydroquinone ..	100 grs.	11·5 gms.
Sodium sulphite ..	1½ oz.	75 gms.
Sodium carbonate..	3 ozs.	150 gms.
Water to.... ..	20 ozs.	1,000 c.c.s.

May be diluted with an equal volume of water.

This formula is not so quick in action as the next one, but there is less tendency for the great density in the high-lights which is easily produced in cases of under-exposure. In all cases the temperature of the hydroquinone developer should not be allowed to fall below 60 deg., or the solution becomes inert.

TWO-SOLUTION (CAUSTIC SODA).

A.—	Hydroquinone	160 grs.	18 gms.
	Sodium sulphite	2 ozs.	100 gms.
	Citric acid	60 grs.	7 gms.
	Potass. bromide	40 grs.	4·5 gms.
	Water to	20 ozs	1,000 c.c.s.
B.—	Caustic soda (stick)	160 grs.	18 gms.
	Water to	20 ozs.	1,000 c.c.s.

For use:—A, 1 oz.; B, 1 oz; water, 2 ozs.

ONE-SOLUTION (WITH FORMALINE).

Hydroquinone	130 grs.	15 gms.
Sodium sulphite	6 ozs.	300 gms.
Formaline	3 drs.	20 c.c.s
Water to	20 ozs.	1,000 c.c.s.

A slow developer, giving great clearness in the shadows, and plenty of density in high-lights, and specially suitable for line-subjects.

Imogen Sulphite.

A.—Imogen sulphite ..	.. ..	1 oz.	83 gms.
Distilled water (warm)	.. ..	12 ozs.	1,000 c.c.s.
B.—Sodium carbonate	.. ..	1 oz.	500 gms.
Water	.. ..	2 ozs.	1,000 c.c.s.

For correct exposure, A, 2 ozs.; B, 2 ozs.; water, 4 ozs. For under-exposure or soft negatives, A, 1 oz.; B, 3 ozs.; water, 4 ozs. For over-exposure, A, 2 ozs.; B, 2 ozs.; water, 3 ozs.; potassium bromide, 40 per cent. solution, 1 oz.

Kachin.

A.—Kachin	.. ..	160 grs. (Avoirdupois)	9 gms.
Sodium sulphite ..	.. ..	$2\frac{1}{2}$ ozs.	62·5 gms.
Water to	.. ..	20 ozs. (fl.)	500 c.c.s.
B.—Sodium carbonate	.. ..	2 ozs.	50 gms.
Water to	.. ..	20 ozs. (fl.)	500 c.c.s.

For use take equal parts of A and B. More diluted developer gives softer results. The solutions should be used at a temperature of 60 to 65 deg F. Assuming exposure to have been correct, with this solution the image commences to appear in about one minute, and when full density is required development is completed in from four to six minutes. Softer effects are obtained in from three to four minutes. No restrainer is really necessary, but in the case of over-exposure the use of a few drops of 5 per cent. solution of ordinary borax is recommended.

Kachin is almost free from staining properties, and is excellent in its clean development of stale plates, on which it does not produce the common iridescent markings.

Metol.

One-Solution (Hauff).

	Metol	150 grs.	17 gms.
	Sodium sulphite	2½ ozs.	125 gms.
	Sodium carbonate	3½ ozs.	175 gms.
	Potass. bromide	16 grs.	1·8 gms.
	Water	20 ozs.	1,000 c.c.s.

For portraits, take stock solution, 1 oz.; water, 1 oz. For landscapes, stock solution, 1 oz.; water, 2 ozs.

Metol gives delicate negative with great detail and little density unless development is greatly prolonged. See "Factorial Development."

Two-Solution (Hauff).

A.—	Metol	150 grs.	17 gms.
	Sodium sulphite	2½ ozs.	125 gms.
	Water to	20 ozs.	1,000 c.c.s.
B.	Sodium carbonate	3½ ozs.	175 gms.
	Potass. bromide	16 grs.	2 gms.
	Water	20 ozs.	1,000 c.c.s.

For portraits, A, 1 oz.; B, 1 oz. For landscapes, A, 1 oz.; B, 1 oz. water, 1 oz.

One-Solution (Andresen).

Metol	160 grs.	18 gms.
Sodium sulphite	3½ ozs.	175 gms.
Potass. carbonate	1¾ ozs.	87·5 gms.
Potass. bromide	22 grs.	2·5 gms.
Water	20 ozs.	1,000 c.c.s.

For use, take 1 part of developer to 3 of water.

TWO-SOLUTION (ANDRESEN)

A.—Metol	.. ..	160 grs	18 gms.
Sodium sulphite	.. .. ..	3½ ozs.	175 gms.
Water	.. ..	20 ozs	1,000 c.c.s
B.—Sodium carbonate	.. ..	3½ ozs.	175 gms.
Water	.. ..	60 ozs	3,000 c c.s.

One part of A is mixed with 3 parts of B, potass. bromide being added as required for prevention of fogging.

Metol-Hydroquinone.

ONE-SOLUTION.

Metol	.. ..	35 grs.	4 gms.
Sodium sulphite	.. .. ..	2 ozs	100 gms.
Hydroquinone	.. .. ..	50 grs.	5·7 gms.
Sodium carbonate	.. .. ..	1½ oz	75 gms.
Distilled water to	.. .. ..	20 ozs.	1,000 c.c.s

This is mixed with an equal volume of water at the time of use.

TWO-SOLUTION

A.– Metol	.. ..	40 grs.	4 5 gms.
Hydroquinone	.. .. ..	50 grs.	5·7 gms.
Sodium sulphite	.. ..	120 grs.	14 gms.
Potass. bromide	.. .. .	15 grs.	1 7 gm.
Water to	.. ..	20 ozs.	1,000 c c s.
B.– Sodium carbonate	.. .. .	½ oz	25 gms.
Water	.. ..	20 ozs.	1,000 c c s.

Mix in equal parts.

In cold weather it is best to increase the quantity of metol to, say, 60 grs (6 8 gms) and reduce the hydroquinone to say, 30 grs. (3·4 gms).

Ortol.

ORTOL-SODA

A.—Ortol	.. ..	140 grs	16 gms.
Potass. metabisulphite	.. ..	70 grs.	8 gms.
Water, cold	.. .. ..	20 ozs.	1,000 c c s.
B.—Sodium carbonate	.. ..	2½ ozs.	125 gms.
Sodium sulphite	. .. ..	3½ ozs	175 gms.
Potass. bromide	.. ..	10 to 20 grs.	1·1 to 2 3 gms.
Water	.. ..	20 ozs.	1,000 c c s

100 minims of 1 in 2 hypo solution may be added to solution A, and is said to brighten the shadows, but this addition is of doubtful value.

In cold weather the potassium bromide may be left out.

For quick development take 1 part of A and 1 part of B. For slow and soft development take 1 part of A, 1 part of B, and 1 part water

Ortol solution should not be made up with sodium sulphite, otherwise red stain may be caused, nor should ammonia be used with it. In other respects it closely resembles pyro.

Paramidophenol.

ONE-SOLUTION.

Potassium metabisulphite ..	6 ozs.	300 gms.
Distilled water	20 ozs.	1,000 c.c.s.
Paramidophenol	2 ozs.	100 gms

Dissolve in the above order and add gradually—

Caustic soda or potash	q.s.

to dissolve the precipitate first formed.

For use, dilute 1 oz. with from 10–30 ounces of water.

Paramidophenol is non-stainless and keeps well in single solution owing probably to its preservative action on soda sulphite.

TWO-SOLUTION.

A.—Paramidophenol hydrochloride ..	200 grs.	23 gms.
Potassium metabisulphite ..	100 grs.	11·5 gms.
Distilled water to..	20 ozs.	1,000 c.c.s.
B.—Sodium sulphite	1¼ oz.	62·5 gms.
Potassium carbonate	1¼ oz.	62·5 gms.
Distilled water to..	20 ozs.	1,000 c.c.s.

For use, mix 1 oz. of A with 2 ozs. of B.

Pyro-Acetone.

A.—Pyro..	1 oz.	100 gms.
Sodium sulphite	4 ozs.	400 gms.
Distilled water to..	9 ozs.	1,000 c.c.s.

Potassium metabisulphite must not be used, unless neutralised, and there should be no addition of citric acid.

A normal developer consists of:—

A. sol (= pyro, 4 grs. or 8 gms.)	40 minims	80 c.c.s.
Acetone	40 minims	80 c.c.s.
Water	1 oz.	1,000 c.c.s.

and is made by measuring out 40 minims of A solution, adding 40 minims of acetone and making up to 1 oz.

Pyro-Ammonia.

(10% SOLUTIONS.)

A.—Pyro	1 oz.	100 gms.
Potass. metabisulphite*	1 oz.	100 gms.
Water to make	9 ozs.	1,000 c.c.s.
B.—Potass. bromide	1 oz.	100 gms.
Distilled water to	9 ozs.	1,000 c.c.s.
C.—Liquid ammonia (0·880)..	1 oz. (fl.)	100 c.c.s.
Distilled water to.. ..	9 ozs.	1,000 c.c.s.

To make a normal developer, take A, 20 minims; B, 10 minims; C, 30 minims; water to 1 oz.; or if no bromide is used, A, 20 minims; C, 10 minims; to water, 1 oz.; or in metric measures, A, 2 c.c.s.; B, 1 c.c.; C, 3 c.c.s.; water to 1 oz.

*Or Soda sulphite 4 ozs. 400 gms.

Pyro-Soda Developer.

(The "B.J." Formula.)

Make up two solutions according to the following formulæ—

A.—Neutral sulphite solution	..	14 ozs.	700 c.c.s.
Pyro (sublimed or cryst.)	..	160 grs.	18 gms.
Water to make	..	20 ozs.	1,000 c.c.s.
B.—Soda carbonate	..	4 ozs.	200 gms.
Water to make	..	20 ozs.	1,000 c.c.s.

Take A, 1 part: B, 1 part: water, 2 parts.

The following is the neutral sulphite solution—

Soda sulphite cryst. ..	.	4 ozs.	200 gms.
Potass. metabisulphite ..	.	½ oz.	25 gms.
Water to	.	20 ozs.	1,000 c.c.s.

This developer will produce negatives free from pyro stain, an 4 to 6 minutes' development at normal temperature with full exposure will yield soft negatives full of detail and well suited to enlarging. The advantages of the developer are its cleanliness and the extraordinary keeping qualities of the A solution.

When stronger negatives are required, the developer can be made up by taking equal parts of A, of B, and of water, or equal parts of A and B alone can be used, this giving a developer containing 4 grains pyro to the ounce.

The mixed solution can be used for several plates in succession if a little extra time is given for development in each case.

It will be noticed that in making up A solution 14 parts of sulphite solution must be added to 6 parts of water, which is equivalent to adding 7 parts to 3. If less sulphite solution is taken, a slightly quicker developer is obtained, but the result will show pyro stain in the lights.

It is as well to use freshly made neutral sulphite solution for making up the A solution if absolute freedom from stain is desired.

The Hurter and Driffield standard pyro-soda developer for plate-speed testing is:—

Pyro	..	8 parts.
Sodium carbonate	..	40 parts.
Sodium sulphite	..	40 parts.
Water to	..	1,000 parts.

Pyro-Caustic Soda.

(Valenta.)

A—Pyro	..	220 grs.	25 gms.
Soda sulphite	..	3¼ ozs.	162·5 gms.
Water to	..	20 ozs.	1,000 c.c.s.

B.—Caustic potash	100 grs.	11·5 gms
or		
Caustic soda	70 grs.	8 5 gms.
Water to	20 ozs.	1,000 c.c.s.

Take A, 1 oz.; B, 1 oz ; water, 1 oz.

The above is a quick-acting and cheap developer, resembling metol in its characteristics.

Pyro-Metol.

A. —Pyro	80 grs.	9·2 gms.
Metol	70 grs.	8 gms.
Potass. metabisulphite	180 grs	20 gms.
Potass. bromide	30 grs.	3·5 gms
Water to	20 ozs.	1,000 c.c.s.
B.—Soda carbonate	3 ozs.	150 gms.
Water to	20 ozs.	1,000 c c.s.

For normal exposures, use equal parts. For under-exposures, increase the proportion of B and add water.

Pyrocatechin.

TWO-SOLUTION.

A. —Pyrocatechin	175 grs	20 gms.
Sodium sulphite	1½ oz.	75 gms.
Water	20 ozs.	1,000 c.c.s.
B. —Potass. carbonate	2½ ozs.	125 gms.
Water	20 ozs	1,000 c c.s.

Equal parts are mixed together.

ONE-SOLUTION.

Sodium sulphite	5 ozs	250 gms.
Water	20 ozs	1,000 c.c.s.
Caustic soda	260 to 300 grs.	30 to 34·5 gms
Pyrocatechin	400 grs.	46 gms

The chemicals are dissolved in this order, and the stock solution kept well corked. It is diluted with 20 times its volume of water for use.

Rodinal.

Rodinal is a concentrated liquid preparation of para-amido-phenol.

For general work, development of negatives:—Rodinal, 1 oz ; water, 25 ozs. A stronger solution, *e g*, Rodinal, 1 oz.; water, 10 oz ; can be used to give density in a shorter time

For over-exposures it is convenient to keep the following stock solution:—

Rodinal	1 oz	30 c.c.s.
Potass. bromide	150 grs.	10 gms.
Water	1 oz	30 c.c.s.

And add a few drops to the 1.30 rodinal developer in cases of over-exposure.

For under-exposures:—Rodinal, 1 oz.: water, 30, 40, or 80 ozs.

Stand Development.

Glycin is a very suitable developer for this purpose, and the following directions are given by Hübl for the use of the formula (given on another page) for a concentrated solution.

Normal developer:—Stock sol., 1 oz.; water, 80 to 90 ozs.; potass. bromide, 10 per cent sol., 80 minims.

In this solution a properly exposed plate should make its appearance in 15 or 20 minutes, and obtain full density in several hours.

For under-exposures.—Stock sol., 1 oz.; caustic soda sol. (10%), 1 oz., water, 50 oz., warmed to 75 deg. F.

For over-exposures:—Stock sol., 1 oz.; potass. bromide, 10% sol. 1 oz.; water, 25 ozs.

Factorial Development.

The total time of development (found by trial to give a certain amount of contrast) divided by the time in which the image first appears is the "factor" of a developer.

The following "Watkins' factors" are abstracted from the instructions from the "Watkins' dark room clock and factorial calculator".—

SUGGESTED FACTORS.

	Grs. pyro to oz.	Factor.
Pyro-soda without bromide	1	18
	2	12
	3	10
	4	8
	5	6½

	Grs. pyro to oz.	Grs. brom. to oz.	Factor.
Pyro-soda with bromide	1	¼	9
	2	½	5
	3	¾	4½
	4	1	4
	8	2	3¼

Pyro-acetone—about double the above figures

	Factor.
Adurol (Schering or Hauff)	5
Amidol (2 grs. per oz.) ..	18
Cristoid developer and film	30
Diamidophenol .. .	60
Diogen	12
Edinol . . .	20
Eikonogen	9
Glycin (carb. sod.) .. .	8
Glycin (carb. pot.) .. .	12
Hydroquinone (min. B) ..	5
Hydroquinone (max. B) ..	4½
Ilford pyro-soda (maximum pyro)	4½
Ilford pyro-soda (minimum pyro)	5½
Imogen sulphite	6
Imperial pyro-soda ..	4¾
Imperial standard (pyro-metol)	9
Kachin . ..	10
Kodak powders	18
Metol	30
Metol-hydroquinone ..	14
Ortol	10
Pyrocatechin	10
Quinomet	30
Rodinal	40

Note.—High-factor developers (*e.g.*, metol and rodinal), owing to the long time which is needed for density, tend to softness. Short-factor developers (*e.g.*, hydroquinone and strong pyro-soda) tend to hardness, as they quickly build up density after the image appears

Where a factor divides evenly into 60, the product is called a divisor, and will greatly facilitate calculating the total time of development. Thus adurol has a divisor of 12 (60 divided by 5), and if the time of appearance in *seconds* is divided by 12 the result is the number of *minutes* to develop.

PYRO-SODA DEVELOPERS.

With and without bromide.

	Factor.		Factor.
Austin-Edwards (with B) ..	5	Marion (with B)	$4\frac{1}{2}$
Barnet (with B)	$4\frac{3}{4}$	Mawson (no B)	10
Cadett (no B)	9	Paget (no B)..	11
Kodak (no B)	12	Thomas (with B)	5
Edwards (with B)	$4\frac{1}{3}$	Wratten (no B)	11
Premier (with B)	$4\frac{1}{3}$	Wellington (normal) ..	11
Gem (with B)	4	Wellington (studio) ..	15

Combined Development and Fixing.

Although there is not much to be said for simultaneous development and fixing on practical grounds, the following formula may be given as one of the best for the purpose :—

A.—Kachin	.. ..	150 grs.	17 gms.
Sodium sulphite	.. .. ..	3 ozs.	150 gms.
Water to	.. ..	20 ozs.	1,000 c.c.s.
B.—Caustic soda	.. .. ..	160 grs.	18 gms.
Water to	.. ..	20 ozs.	1,000 c.c.s.
C.—Hypo	.. ..	1 oz.	560 gms.
Water to	.. ..	2 ozs.	1,000 c.c.s.

Take :—A, 160 minims ; B, 24 minims ; C, 20 minims ; water to 1 oz ; or, A, 32 c.c s. ; B, 5 c.c.s. ; C, 4 c.c.s. ; water to 100c.c.s.

Restrainers.

Potassium bromide in 10 per cent. solution is the most common restrainer. The dose is from one half-grain (5 minims) per ounce of developer.

Ammonium citrate solution has the advantage that after it has been added to the developer density can be obtained without further fogging, though the development of detail is prevented. An average dose with the pyro-ammonia developer is 6 to 10 grains per ounce (60 to 100 minims of solution made by adding ammonia, about 250 minims, to 1 ounce of citric acid dissolved in a little water until neutral, and diluting the whole to 10 ounces).

Potassium borotartrate.—10 to 30 minims of a 10 per cent. solution restrain with most developers.

Sodium bicarbonate acts as a restrainer, particularly with amidol developer.

FIXING, & HYPO ELIMINATORS.

Acid Fixing Baths.

Hypo	4 to 6 ozs	200 to 300 gms.
Potass metabisulphite	½ oz	25 gms
Water	20 ozs	1,000 c c s

This is the best formula we know for an acid fixing bath for plates or papers It keeps clear and stainless to the last, and does not throw down sulphur with use.

The following is a cheaper bath —

Hypo solution (1 . 5)	50 ozs.	1 000 c.c s.

To which add a mixture of –

Tartaric acid solution (1 2)	1½ oz	30 c c s.
Sodium sulphite solution (1 . 4)	3½ ozs.	70 c.c.s.

Alum-Hypo Fixing Bath.

Alum (saturated solution)	20 ozs.	1,000 c c.s.
Sodium sulphite (saturated solution)	4—7 ozs.	200-300 c.c s
Hypo-solution (1 5)	20 –28 ozs.	1,000-1,250 c c s

Chrome Alum and Hypo Fixing Bath.

Add—

Strong sulphuric acid	1 dr (fl)	10 c c s.
Water	2 ozs.	80 c c s.

to—

Sodium sulphite	2 ozs.	80 gms.
Water	6 ozs.	240 c c.s.

And pour the mixture into –

Hypo	16 ozs.	700 gms.
Water	48 ozs.	2,000 c c.s.

Finally add to the above mixture –

Chrome alum	1 oz	40 gms
Water	8 ozs	300 c c.s.

Hypo-Eliminators.

Permanganate.

Wash the negative for one minute under the tap, and transfer to a shallow dish containing water with enough potass. permanganate in it

to turn it pink. Remove the negative as soon as the colour goes (which will be in a second or two if hypo is present), and keep on treating in the very weak permanganate baths until the colour is not discharged. The water itself will destroy the permanganate colour, but not quickly as hypo does. A very cheap and satisfactory process which allows of a negative being ready for drying within three minutes of fixation.

Peroxide of hydrogen (20 vols.) ..	1 dr.	25 c.c s.
Water	5 ozs.	1,000 c c s.

After washing the negative well it is immersed for a couple of minutes in the solution and again rinsed in water.

Where peroxide of hydrogen is not obtainable, the following may be used as a substitute.—

Barium dioxide	1 oz.	25 gms.
Glacial acetic acid	1 oz.	25 gms.
Water	40 ozs.	1,000 c c.s.

Reduce the barium dioxide to a fine powder and add it gradually to the acid and water, shaking until dissolved. A few minutes' immersion in this solution will effectually remove or destroy the last traces of hypo.

PERSULPHATE.

Ammonium persulphate	2½ grs.	6 gms
Carbonate of soda..	5 grs	12 gms.
Water	1 oz.	1 000 c.c.s.

PERCARBONATE.

Potassium percarbonate	2½ grs.	6 gms
Water	1 oz.	1,000 c.c.s

Rapid Drying of Negatives.

Method I. —Rinse from the hypo-bath, place in 1 : 50 formaline for ten minutes, wash by pouring nearly boiling water six times over the negative and dry by heat. To get rid of the relief which is produced by this process the negative is rubbed with a piece of wash-leather moistened with alcohol.

Method II.—After washing in the usual way or using a hypo-eliminator, lay a piece of old fine cambric on the negative and firmly pass a roller squeegee over it The negative, with much of the water thus removed, will dry in a few minutes in a moderately warm place.

Method III.—Soak in two successive baths of methylated spirit, and place in a current of air. The present commercial spirit, owing to the mineral naphtha in it, causes a whitish scum on the surface of the film, and is not favourable to clean work.

HARDENING AND CLEARING SOLUTIONS.

Hardening Baths.

Formaline	1 oz	50 c c s
Water	10 to 20 ozs	500 1 000 c c s
Alum	1 oz	50 gms
Water	20 ozs	1 000 c.c s
Chrome alum	1 oz	50 gms
Water	20 ozs	1 000 c c s

Clearing Solutions.

ACID ALUM

Alum	2 ozs	200 gms
Citric acid	1 oz	100 gms
Water	10 ozs	1 000 c c s

Wash well after fixing and immerse the negative in the above This bath is also useful for removing white scum from negatives developed with ferrous oxalate if rubbed on with cotton wool

CHROME ALUM

Chrome alum	¼ oz	25 gms
Hydrochloric acid	¼ oz	25 c c s
or		
Citric acid	1 oz	50 gms
Water	20 ozs	1,000 c c s

We prefer this latter bath for the final treatment of negatives, and for obtaining a clean smooth film

THIOCARBAMIDE.

Thiocarbamide	90 grs	10 gms
Citric acid	90 grs	10 gms
Water	20 ozs	1 000 c c s

SODIUM HYPOCHLORITE

(*Eau de Javelle*)

Bleaching powder	1 oz	30 gms
Sodium carbonate	1½ oz	45 gms

Shake up the bleaching powder with a solution of the carbonate in a little water (6 ozs or 180 c c s), and filter Extract the residue with plain water, and again filter The filtrate (solution of sodium hypochlorite) forms an active stain remover It can be acidified with oxalic acid, and then discharges yellow stain still more vigorously, but with risk to the silver image

Removing Silver Stains.

Soak the negative in—

A.—Potass. iodide	200 grs.	45 gms.
Water	10 ozs.	1,000 c.c.s.

and after washing transfer to—

B.—Potass. cyanide	300 grs.	70 gms.
Water	10 ozs.	1,000 c.c s.

in which rub the stained part of the film with a pledget of cotton wool.

If the stain does not yield to this treatment a solution of iodine (in potass. iodide) may be used in place of solution A.

A remedy for silver stains, which sometimes succeeds, is to rub with pumice powder, and place in strong hypo.

NEGATIVE INTENSIFIERS.

Mercury Intensification.

The negative is bleached in the following saturated solution of mercury bichloride:—

Mercury bichloride (corrosive sublimate)	1	62 gms.
Hot water	16	1,000 c.c.s.

After cooling this solution and pouring off from the white feathery crystals thrown down, add—

Hydrochloric acid..	30 minims	4 c.c.s.

After well washing, the bleached negative is blackened in one or other of the following:—

A.—Ammonia (0 880)	20 drops	20 drops
Water	1 oz.	30 c.c.s.

Gives great intensification and good black colour.

B.—Soda sulphite, 10 per cent. solution, made slightly acid with citric acid. Very slightly strengthens a negative.

C.—An alkaline developer, such as pyro-soda, pyro-ammonia, hydroquinone. Gives about double the intensification of B.

D.—Schlippe's salt	200-400 grs.	20-40 gms.
Water	20 ozs.	1,000 c.c.s.

This solution must be made fresh, and gives great intensification.

E.—Ferrous oxalate developer, made as directed under "Developers." This process can be repeated as many times as desired, and gives absolutely permanent results: it deals evenly throughout with the tones in the negative.

Monckhoven's.

A.—Bromide of potassium	.. ..	10 grs.	23 gms.
Bichloride of mercury	.. ..	10 grs.	23 gms.
Water	.. ..	1 oz.	1,000 c.c.s.
B.—Pure cyanide of potassium	..	10 grs.	23 gms.
Nitrate of silver	.. .. ..	10 grs.	23 gms.
Water	.. ..	1 oz.	1,000 c.c.s.

The silver and cyanide are dissolved in separate lots of water, and the former added to the latter until a permanent precipitate is produced. The mixture is allowed to stand 15 minutes, and, after filtering, forms Solution B.

Place the negative in A till it is white, then rinse and transfer it to Solution B. If the intensification has been carried too far, it may be reduced by treatment with a weak solution of hyposulphite of soda.

Mercuric Iodide.

Water	.. ..	20 ozs.	1,000 c.c.s.
Sodium sulphite	.. .. ..	4 ozs.	200 gms.
Mercuric iodide	.. .. ..	90 grs.	10 gms.

The sulphite must be dissolved first. The solution keeps well in the dark. The plate needs to be rinsed only from the fixing bath, and requires to be immersed for only a few minutes in water and then for a few seconds in hypo (10 grs. per oz.) after sufficient intensification has been obtained. Greater permanency is secured by treating instead with any non-staining developer, or, better, with 5 per cent. solution of sodium sulphite.

If mercuric iodide is not available the following may be used:—

Mercuric chloride	.. .. ..	50 grs.	6 gms.
Water	.. ..	10 ozs.	500 c.c.s.

Add 10 per cent. potass. iodide solution until precipitate first formed is redissolved. About 1½ oz. (75 c.c.s.) will be required, and, when clear, add—

Sodium sulphite	.. .. ..	4 ozs.	200 gms.
Water to make	.. .. ..	20 ozs.	1,000 c.c.s.

Silver Intensifiers.

J. B. B. Wellington's Formula.

Silver nitrate	.. .. ..	120 grs.	7·75 gms.
Water	.. ..	2 ozs.	60 c.c.s.
Add—			
Ammonium sulphocyanide	..	240 grs.	15·5 gms.
Water	.. ..	3 ozs.	85 c.c.s.

This mixture is best made at the time of use, although it may be left for several weeks. To prepare the intensifier, take—

Above mixture	.. .. ..	¼ oz	30 c.c.s.
Hypo solution (1 in 4)	.. ..	enough to just dissolve white ppt	
Pyro (10% sol.) with sulphite	..	30 minims	4 c.c.s.
Ammonia (10% sol.)	.. ..	40-60 minims	6-8 c.c.s

Plates should be hardened with alum or formalin, for both this and the following intensifier When sufficient density is obtained the negative is fixed for a minute or two and washed

ACID SILVER.

A	Pyro	.. .. ..	15 grs.	3 5 gms
	Citric acid	.. ..	5 10 grs.	1 2 gms
	Water	.. ..	10 ozs	1,000 c.c s.
B	Silver nitrate	.. .. ..	10 grs.	23 gms
	Water to	.. ..	1 oz.	1,000 c c.s

About 1 oz (30 c c s) of A is poured over the plate, once or twice, about 15 drops of B solution added, and the mixture again applied. Intensification now takes place and the solution is poured off and on until sufficient. If intensifier becomes very thick and turbid, fresh should be mixed up When dense enough the negative is rinsed, fixed and washed Negatives (on gelatine plates) are best hardened with alum or formaline before using this intensifier, otherwise it is difficult to avoid stains

Chromium Intensifier.

(*C Welborne Piper*)

	A	B	C.
Potassium bichromate ..	5 grs.	10 grs	10 grs
Hydrochloric acid (sp gr, 1 160)*	1 minims	5 minims	20 minims
Water	1 oz	1 oz.	1 oz.

Bleach in A, B or C solution, wash until yellow stain is removed, and then develop (by daylight, or after exposure to daylight) with amidol

A gives intensification about equal to mercury and ammonia; B, to that of mercury and ferrous oxalate, and C, to that of mercury and sodium sulphite

The process may be safely applied after fixation if the plate is simply rinsed for a minute or so.

It may be repeated several times if the first application does not give enough density.

Copper Intensifier.

A	Copper sulphate	..	100 grs.	230 gms
	Water	..	1 oz.	1,000 c.c.s.
B –	Potass. bromide	..	100 grs.	230 gms.
	Water to	..	1 oz.	1,000 c.c.s.

[illegible]

A and B are separately made up with hot water, mixed, and allowed to cool. The negative is bleached in the mixture, and washed for a minute or two. It is then blackened in :—

Silver nitrate	45 grs.	100 gms.
Water (distilled)	1 oz.	1 000 c c s.

For still greater density, the negative is well washed from silver, and an ordinary developer applied.

If too dense, after the silver, it can be placed in weak hypo solution (about 10 grs per oz) or weak potass. cyanide (about 2 grs per oz).

Lead Intensifier.

Lead nitrate	400 grs.	46 gms.
Potass. ferricyanide .. .	600 grs.	70 gms.
Acetic acid	3 drachms	20 c c s.
Water to	20 ozs.	1,000 c c s.

This stock solution will keep for a long time in the dark. The negative is bleached in it, washed once *very carefully* in 10 per cent. nitric acid—the acid makes the film very tender—then in water, and then darkened in :—

A.--Sodium sulphide	1 oz.	50 gms
Water	20 ozs.	1,000 c.c.s.
Or in—		
B Schlippe's salt . . .	90 grs	10 gms
Ammonia (0 880) .	6 drachms	40 c c s
Water ..	20 ozs	1,000 c.c.s.
Or in—		
C. -Potass. bichromate .. .	1 oz	100 gms
Ammonia (0 880)	½ oz.	50 c c.s.
Water	10 ozs.	1,000 c.c.s.

The lead intensifier gives very great intensification, and is suited only for line-subjects.

Uranium Intensifier.

A.—Uranium nitrate	100 grs.	23 gms.
Water	10 ozs.	1,000 c c s.
B.—Potass. ferricyanide	100 grs.	23 gms.
Water	10 ozs.	1 000 c c.s.

The intensifier is prepared from :—A sol., 1 oz. ; B sol 1 oz. , acetic acid, 2 drachms.

The plate must be per[illegible] hypo, and after intensification be washed in several [illegible] water until the yellow stain is gone. A 10 gr. per oz. [illegible] ammonium sulphocyanide removes any yellow stain, and [illegible] carbonate removes the intensification [illegible] negative to its original state. A weak acetic [illegible] applied to the negative if the intensifier is [illegible]

NEGATIVE REDUCERS.

Farmer's.

Hypo solution (1 : 5)	5 ozs.	150 c.c.s.
Potass. ferricyanide (10% sol.) ..	quant. suff.	quant. suff.

The colour is a fair indication of the strength of the reducer; it should be pale yellow, not orange, and should be used weak rather than strong, since its selective action on the shadows of a negative is then less. Yellow stain is due usually to the use of an acid fixing bath, or an old fixing bath, instead of clean plain hypo solution. It is not easy to remove.

Belitski's.

Potass. ferric oxalate	150 grs.	10 gms.
Sodium sulphite	125 grs.	8 gms.
Water..	7 ozs.	200 c.c.s.

Dissolve and add—

Oxalic acid..	40 to 45 grs.	2·5 to 3·1 gms.

and shake until the solution turns green. Then pour off from undissolved crystals and add—

Hypo	1¾ oz.	50 gms.

Instead of the ferric oxalate the following more easily obtainable chemicals can be used in the formula :—

Ferric chloride cryst.	100 grs.	6·5 gms.
Potass. oxalate	190 grs.	12·5 gms.

This reducer is stainless, and keeps well in the dark. Its action on the shadow detail of the negative is similar to that of Farmer's.

Persulphate.

Ammonium persulphate.. ..	10 to 20 grs.	23 to 45 gms.
Water	1 oz.	1,000 c.c.s.

A fresh solution is made at time of use. A drop of sulphuric acid per 2 ozs. makes the action more regular. It is best also to use the reducer before the negative has dried. When sufficiently reduced —indeed, slightly before—the negative is placed at once into 5 per cent. sodium sulphite solution. If much reduction has taken place it is well to fix a second time. The persulphate reducer acts first on the heavy high-light densities of the negatives, reducing these without affecting shadow detail.

Eder's (Mercury and Cyanide).

Potassium cyanide	20 grs.	5 gms.
Potassium iodide	10 grs.	2 gms.
Mercury bichloride	10 grs.	2 gms.
Water	10 ozs.	1,000 c.c.s.

Dissolve the mercury, then the iodide, and lastly the cyanide to dissolve the red precipitate formed. The solution reduces slowly, and is non-staining and intensely poisonous.

Iodine-Cyanide.

Iodine (10 per cent. sol. in potass. iodide sol.)	30 minims	6 c.c.s.
Potass. cyanide (10 per cent. sol. in water)..	5 minims	1 c.c.s.
Water	1 oz.	100 c.c.s.

A very clean-acting (but intensely poisonous) reducer. Very suitable, when used quite weak, for bromide prints, as it leaves no stain.

Ceric Sulphate.

Sulphuric acid (sp. gr. 1·98) ..	20 minims	4 c.c.s.
Water	2 ozs.	200 c.c.s.
Dissolve in this—		
Ceric sulphate	2 ozs.	100 gms.
And dilute to—		
Water	10 ozs.	1,000 c.c.s.

Hard negatives are placed wet in a mixture of this stock solution and nine times its volume of water. Reduces contrasts. Over-exposed, long-developed negatives are dipped dry into a mixture of stock solution and an equal part of water and carefully watched as the action is very rapid. A convenient form of the reducer is the stock solution sold by Lumière.

Permanganate.

Potass. permanganate, 10% solution	1 dr.	10 c.c.s.
Sulphuric acid (10% solution by volume of 1·98 acid)	5 drs.	50 c.c.s.
Water	10 ozs.	1,000 c.c.s.

Applied to a wet negative gives even reduction. A dry negative receives greater reduction in the high-lights, and great softening may be obtained by immersing dry negative quickly in the reducer, washing immediately, drying and re-immersing. Any brown stains are removed with a 10% solution of sodium sulphite containing 2% oxalic acid.

Bichromate.

Potass. bichromate	100 grs.	20 gms.
Sulphuric acid ..	7 drs. (fl.)	40 c.c.s.
Water	20 ozs.	1,000 c.c.s.

Hypochlor and Alum.

Chrome alum	10 grs.	4 gms.
Eau de Javelle	½ oz.	100 c.c.s.
(See "Clearing Solutions")		
Water to make	5 ozs.	1,000 c.c.s.

Immerse the negative and gently rub the surface with a piece of cotton wool. By confining friction with the wool to certain parts, extra reduction can be obtained.

Eder's Method of Reducing Hard Negatives.

Potass. bichromate	90 grs.	10 gms.
Hydrochloric acid	1 oz. (fl.)	30 c.c.s.
Alum	1 oz.	50 gms.
Water	20 ozs.	1,000 c.c.s.

The negative is bleached through to the back in this solution, well washed and redeveloped in any non-staining developer, such as glycin or rodinal, only up to the right degree of contrast.

Baskett's (Local) Reducer.

It consists of—

Globe metal polish	2d. tin
Terebene	2 ozs.
Salad oil	2 ozs.

The ingredients are to be well mixed, and strained through fine muslin two or three times to remove any coarse particles.

NEGATIVE VARNISHES.

Hot Varnishes.

No. 1.—Sandarac..	4 ozs.	113 gms.
Alcohol	28 ozs.	800 c.c.s.
Oil of lavender	3 ozs.	85 c.c.s.

This is a good varnish for retouching upon, and a tooth is easily obtained by rubbing.

No. 2.—Seed lac	2 ozs.	50 gms.
Sandarac..	2 ozs.	50 gms.
Oil of lavender	½ oz.	12·5 gms.
Castor oil	1 oz.	25 c.c.s.
Alcohol	40 ozs.	1,000 c.c.s.

To prepare a good surface for the retouching pencil, the negative after varnishing is dusted over with fine resin powder and rubbed up with the fingers.

No. 3.—White hard varnish	15 ozs.	150 c.c.s.
Rectified spirit (not methylated spirit)	20 to 30 ozs.	200 to 300 c.c.s.

This will be found a good and cheap varnish if durability is not required, as it is easily rubbed up for retouching upon and easily cleaned off. Very suitable for enlarged negatives that are not to be retained.

No. 4.—Bleached shellac	1¼ ozs.	62 gms.
Mastic	¼ oz.	13 gms.
Oil of turpentine	¼ oz.	13 c.c.s.
Sandarac..	1¼ oz.	62 gms.
Alcohol	20 ozs. (fl.)	1,000 c.c.s.

Tough, hard, and durable.

No 5.—Sandarac ..	.. .. ..	80 ozs.	160 gms.
Turpentine	.. .. ..	36 ozs	72 c.c.s.
Oil of lavender ..	.. ..	10 ozs.	20 c.c.s.
Alcohol ..	.. .. ..	500 ozs.	1,000 c.c.s.

This one may also be rubbed down with powdered resin, and gives a splendid surface for retouching

No. 6.—Sandarac	.. .. ..	1 oz.	55 gms.
Seed lac ..	.. .. ..	1½ oz.	83 gms.
Castor Oil	.. .. ..	3 drs	20 c.c.s
Oil of lavender ..	.. ..	1½ dr.	10 c.c.s.
Alcohol ..	.. .. ..	18 ozs (fl.)	1,000 c.c.s

This varnish is somewhat dark in colour.

No. 7.—Best orange shellac	.. ..	2½ ozs.	125 gms
Oil of lavender or oil of turpentine ..	.. .. ..	¼ oz.	13 c.c.s
Methylated alcohol	.. ..	20 ozs	1,000 c.c.s.

Keep in a warm place until dissolved, then add a large teaspoonful of whiting or prepared chalk; shake, set aside to clear, and then decant. This is specially recommended for gelatine negatives.

Cold Varnishes.

No. 1.—Celluloid ..	.. .. ..	1 oz	10 gms.
Amyl acetate	.. .. ..	50 ozs.	500 c.c.s

This may be flowed over or applied with a brush to the negative, and requires no heat

No. 2—Zanzibar copal ..	. ..	6 ozs	30 gms
Amber (fused) ..	.. ..	1 oz	5 gms.
Ether ..	.. . ..	60 ozs.	300 c.c.s.
Acetone ..	.. . ..	40 ozs.	200 c.c.s
Chloroform	.. .. ..	4 ozs.	20 c.c.s.
No. 3—20% shellac solution	.. ..	2 ozs.	160 c.c.s
Ammonia (0 880)	.. ..	3 drs.	30 c.c.s.
Methylated spirit	.. ..	4 ozs	320 c.c.s.

A mixture of Japanese gold size (1 part) and benzole (2 parts) forms a rather slow-drying though otherwise excellent cold varnish. The surface takes the pencil well.

Shellac Water Varnish.

Shellac	.. ..	3 ozs.	100 gms.
Sodium carbonate (saturated solution)	.. ..	24 ozs.	800 c.c.s.

The shellac is allowed to soak in the liquid for twenty-four hours, the liquor is then poured away and replaced by an equal quantity of water, and the mixture boiled until the shellac dissolves After standing some time the liquid becomes perfectly clear and bright.

Film Varnishes.

The above water varnish is suitable, or the following:—

Borax	300 grs.	30 gms.
Glycerine	300 minims	30 c.c.s.
Shellac	600 grs.	60 gms.
Water	20 ozs.	1,000 c.c.s.

Boil together for about half an hour, then add—

Methylated spirit	5 ozs.	250 c.c.s.

and filter.

Another good varnish for celluloid films is—

Dammar	500 grs.	115 gms.
Benzole	10 ozs.	1,000 c.c.s.

in which, after filtration, the films are immersed and then hung up to dry.

Celluloid in amyl acetate (No. 1 in "Cold Varnishes" above) can also be used and is an excellent varnish for films.

Retouching Medium.

Pale gum resin	200 grs.	230 gms.
Gum dammar	90 grs.	100 gms.
Gum mastic	20 grs.	23 gms.
Oil of juniper	1 gr.	1 gm.
Oil of turpentine	2—4 ozs.	1,000-2,000 c.c.s.

The gums are powdered and added to the oils and finally enough pure asphaltum is added to give the mixture a dark amber colour when viewed through the depth of an inch.

This formula is strongly commended by Whiting in his "Retouching" as not liable to pick, rub off, or come off on after-varnishing. It takes a great deal of work.

Ground-Glass Varnish.

Sandarac	90 grs.	103 gms.
Mastic	20 grs.	23 gms.
Ether (0·720)	2 ozs.	1,000 c.c.s.

Dissolve the resins in the ether and afterwards add—

Benzole	¼ to 1½ ozs.	120-700 c.c.s.

The proportion of the benzole added determines the nature of the matt obtained.

This varnish must be applied to the cold negative or the coating will not be matt.

Malachite green, aurantia, or asphaltum is used for tinting it green, yellow, or brown respectively (for handwork on back of negative).

Spotting Medium.

Indian ink	water colour chalk.
Payne's grey	water colour chalk.

Grind together with water only on a palette to match the colour of the negative.

Blocking-Out Mixtures.

No. 1.—Gamboge and vermilion red, or Payne's grey and vermilion, are ground together in water in equal parts with addition of a little gum water if a glossy surface is required.

No. 2.—Asphaltum	.. .. ..	1 oz.	100 gms.
Wax	.. ..	170 grs.	40 gms.
Carbon black	.. .. ..	80 grs.	20 gms.
Turpentine	.. .. ..	10 ozs.	1,000 c.c.s.

Commercial "Brunswick black" is equal to and more convenient than the above mixture.

Titles on Negatives.

The usual method is to have the words forming the title set up in type and photographed on a "process" plate. The subject negative having been made with a clear margin round it, a strip of the title negative is laid down on this margin by stripping and the clear margin then filled up with "photopake" or other blocking-out mixture except over the strip of title, which is made dense enough, in the first instance, to print white. If a clear portion in a landscape negative cannot be found (in cases where the title has to appear on the view), a piece must be cut out with a sharp knife.

STRIPPING.

Gelatine Glass Negatives.

(*Middleton and Holcroft.*)

Stock solution: —

Methylated spirit	.. .. ..	25 ozs.	250 c.c.s.
Water	.. ..	1 oz	10 c.c.s.
Glycerine	.. ..	1 oz.	10 c.c.s.

To prepare the "stripping solution" 6 to 30 drops of commercial hydrofluoric acid are added to 1 oz. (30 c.c.s.) of the above. The film is cut through all round about $\frac{1}{8}$ inch from the edge, and placed level by aid of three wedges. The "stripping solution" is spread with a strip of paper, and the loose edgings of film removed as soon as they come away without any pull whatever. The looseness of the main film is now tested by passing a waxed silk thread, stretched on a bow underneath it. If all is free, the solution is poured off, and plain "stock solution" poured on.

The loose film is now transferred to a glass plate, previously coated with a coating of gum, which should be so thin as to show only when the plate is moistened with the finger. As lifters of the films, "paraffin sheets" (made by soaking thin paper in hot melted paraffin for about half an hour) are used, being semi-transparent and free from buckle. One is laid on the film and lightly squeegeed down. The two

are removed together in contact by slipping the blade of a penknife under the film, which is then applied to the gummed glass plate after flowing the latter with the "stock solution." Again lightly squeegee, and remove the paraffin sheet.

A less rapid solution, but one which will be safe in the case of an old or hardened negative, is:—

Methylated spirit..	1 oz	80 c.c s
Water	2 ozs.	160 c.c.s
Hydrofluoric acid	60 minims	10 c.c.s.

These proportions may be slightly altered for different commercial spirits and acids

Film Negatives.

Caustic soda	10 grs.	23 gms.
Formaline	10 minims	20 c.c.s.
Water	1 oz.	1,000 c c.s.

The celluloid negative is immersed in this solution until the film shows signs of detachment and can be rolled back with the finger. It is then placed in

Hydrochloric acid	25 minims	50 c.c s.
Glycerine	25 minims	50 c c.s.
Water	1 oz.	1,000 c.c.s.

in which it is removed from its original support to a glass or other base.

WET COLLODION AND COLLODION EMULSION.

Wet Collodion.

Pyroxyline (Hardwich).

Sulphuric acid, 1·845	18 ozs. (fl.)	600 c c.s
Nitric acid, 1 457	6 ozs. (fl.)	200 c.c.s.
Water	5-5¼ ozs (fl)	167-182 c c.s.
Cotton-wool	300 grs.	23 gms.

Temperature, 150 degrees F. (65 degrees C.) Time of immersion ten minutes

Iodised Collodion

For Acid Pyro Developer.

Ether, specific gravity 0 725 ..	10 ozs. (fl.)	1,000 c.c.s.
Alcohol, specific gravity 0 805 ..	4 ozs. (fl.)	400 c.c.s.
Pyroxyline	120 grs.	27 gms.
Ammonium iodide	30 grs.	7 gms.
Cadmium iodide	45 grs.	10 gms.
Alcohol (0·830)	4 ozs. (fl.)	400 c.c.s.

BROMO-IODISED COLLODION.

For Iron Developer.

Ether, specific gravity 0·725	..	10 ozs. (fl.)	1,000 c.c.s.
Alcohol, specific gravity 0 805	..	5 ozs (fl.)	500 c.c.s.
Pyroxyline	..	120 grs.	27 gms.
Ammonium iodide ..	..	40 grs.	9 gms.
Cadmium iodide ..	..	40 grs.	9 gms.
Cadmium bromide ..	..	20 grs.	4·5 gms.
Alcohol (0·830)	..	5 ozs. (fl.)	500 c.c.s.

Thinning Collodion after Use.—A mixture of sulphuric ether (0·720), 3 parts, and alcohol (0·805), 2 parts, is generally used.

THE NITRATE BATH.

Silver nitrate	..	6 ozs.	75 gms.
Distilled water	..	80 ozs. (fl)	1,000 c c.s.
Nitric acid (pure)	..	8 minims	0 2 c.c.s.

Saturate with iodide of silver, which may be done by coating a plate with collodion and leaving it in the bath for some hours. Filter.

DEVELOPER.

No. 1.—Ferrous sulphate ..	..	½ oz.	50 gms.
Glacial acetic acid ..	..	½ oz.	50 c.c.s.
Alcohol	..	½ oz	50 c.c.s.
Water	..	10 ozs.	1,000 c.c.s.
No. 2.—Ferrous ammonio-sulphate	..	75 grs.	43 gms.
Glacial acetic acid ..	..	75 grs.	43 gms.
Copper sulphate	..	7 grs.	4 gms.
Water	..	4 ozs.	1,000 c c.s.
Alcohol	..	¼ oz.	60 c c.s

INTENSIFIER.

Pyrogallic acid	..	90 grs	10 gms.
Citric acid	..	60 grs.	7 gms.
Acetic acid (glacial) ..	..	1 oz.	50 c c s.
Water	..	20 ozs	1,000 c c.s.

The copper intensifier (see "Intensifiers") is used for greater density, each solution being flowed over the plate with a rinse between.

Positives and Ferrotypes by Wet Collodion.

BROMO-IODISED COLLODION.

Ether, specific gravity 0·725	..	10 ozs. (fl.)	1,000 c.c.s.
Alcohol, specific gravity 0·805	..	5 ozs. (fl.)	500 c.c s.
Pyroxyline	..	100 grs.	23 gms
Cadmium iodide	..	50 grs	11½ gms
Ammonium bromide ..	..	25 grs	5 7 gms
Alcohol, 0·830	..	5 ozs. (fl.)	500 c c.s

Note.—The iodides should be dissolved in the weaker spirit, and the pyroxyline in the ether and stronger spirit, and the two solutions mixed.

Silver Bath.

Silver nitrate (recryst.)	5½ ozs.	70 gms.
Distilled water	80 ozs. (fl.)	1,000 c.c.s.
Nitric acid (pure)	½ dr.	0·8 c.c.

Saturate with iodide of silver and filter as above.

Developers.

Ferrous sulphate	150 grs.	34 gms.
Glacial acetic acid	½ oz.	50 c.c.s.
Nitric acid	5 minims	1 c.c.
Alcohol	½ oz.	50 c.c.s.
Water	10 ozs.	1,000 c.c.s.

Note.—By increasing the proportion of nitric acid and decreasing that of the acetic, the image will be more metallic in appearance.

Nitrate of Iron Developer.

Ferrous sulphate	1½ oz.	75 gms.
Barium nitrate	1 oz.	50 gms.
Water	20 ozs.	1,000 c.c.s.
Alcohol	1 oz.	50 c.c.s.
Nitric acid	40 drops	4 c.c.s.

The insoluble barium sulphate which is formed must be filtered out.

Fixing Solution.

Potassium cyanide	½ oz.	25-30 gms.
Water	15-20 ozs.	1,000 c.c.s.

Developer for Collodion Transfers.

Pyrogallic acid	4 grs.	9 gms.
Citric acid	3 grs.	7 gms.
Acetic acid	20 minims	41 c.c.s.
Water	1 oz.	1,000 c.c.s.
Alcohol	20 minims	41 c.c.s.

Wet Collodion for Half-Tone.

For Winter.

A.—Colloidin	190 grs.	21 gms.
Ether (0·720)	12 ozs.	600 c.c.s.
Alcohol (0·805)	8 ozs.	400 c.c.s.

For Summer.

B.—Colloidin	190 grs.	21 gms.
Ether (0·720)	10 ozs.	500 c.c.s.
Alcohol (0·805)	10 ozs.	500 c.c.s.

Iodizer.

Cadmium iodide	600 grs.	68 gms.
Ammonium iodide	210 grs.	24 gms.
Sodium iodide	210 grs.	24 gms.
Cadmium bromide	210 grs.	24 gms.
Alcohol	20 ozs.	1,000 c.c.s.

Use: Iodizer, 1 part; collodion, 15 parts; and set the mixture aside for at least 4 days to ripen. It should then be a bright yellow; if not, add to each ounce 1 minim of a solution of:—Iodine, 16 grs.; alcohol, 1 oz.

Collodion Emulsion.

PYROXYLINE FOR COLLODIO-BROMIDE OR UNWASHED EMULSION.

Nitric acid, specific gravity 1·45	2 ozs. (fl.)	285 c.c.s.
Sulphuric acid, specific gravity 1·845	4 ozs.	570 c.c.s.
Water	1 oz. (fl.)	145 c.c.s.
Cotton (cleaned and carded) ..	100 grs.	33 gms.

Temperature, 150 degrees F. (65 degrees C.). Time of immersion 10 minutes.

FOR WASHED EMULSION.

Nitric acid, specific gravity 1·45.	2 ozs. (fl.)	400 c.c.s.
Sulphuric acid, specific gravity 1·845	3ozs.	600 c.c.s.
White blotting-paper	145 grs.	66 gms.

Temperature, 100 degrees F. (38 degrees C.). Time of immersion 30 minutes.

COLLODIO-BROMIDE EMULSION.

Ether, specific gravity 0·720 ..	5 ozs. (fl.)	620 c.c.s.
Alcohol, specific gravity 0·820 ..	3 ozs.	380 c.c.s.
Pyroxyline..	50 grs.	14·3 gms.
Cadmium ammonium bromide..	80 grs.	23 gms.
or		
Zinc bromide	76 grs.	21·5 gms.

Sensitise by adding to each ounce 15 grs. of nitrate of silver dissolved in a few drops of water and 1 drachm of boiling alcohol. This is suitable for slow landscape work or for transparencies.

WASHED EMULSION (for Transparencies).

Ether, specific gravity 0·720 ..	5 ozs. (fl.)	620 c.c.s.
Alcohol specific gravity 0 820 ..	3 ozs.	380 c.c.s.
Pyroxyline or papyroxyline ..	60 grs.	17 gms.
Cadmium ammonium bromide ..	100 grs.	29 gms.
or		
Zinc bromide	96 grs.	27·5 gms.
Hydrochloric acid (specific gravity 1·2)	8 minims	2 c.c.s.

Sensitise with 20 grs. of silver nitrate to each ounce (4·3 grs. to each 100 c.c.s.), dissolved in a minimum of water with 2 drachms (13 c.c.s.) of boiling alcohol. Allow to stand for two or three days.

N.B.—In the last formula the emulsion, after being allowed to ripen for the time stated, should be poured into a dish and allowed to become thoroughly dry. The mass of dry emulsion is then washed to remove all the soluble salts, and is then again dried and redissolved in equal parts of ether and alcohol, at the rate of from 20 to 24 grs. to the ounce of solvents.

Wellington's Collodio-Bromide Emulsion Formula.

Pyroxyline	30 grs.	23 gms.
Ether	12 drs.	500 c.c.s.
Alcohol	12 drs	500 c.c.s.

To bromise, add 30 grs. (33 gms) bromide ammonium dissolved in 45 minims (31 c.c.s. water), to which 4 drachms (170 c.c.s.) of alcohol are afterwards added; 50 grs. (33 gms.) of nitrate of silver dissolved in a drachm (4½ c c.s) of water are then added. After washing and drying, the pellicle is dissolved in 1¾ oz. (58 c.c.s.) of ether, and the same of alcohol.

Developer for Collodion Emulsion

An excellent developer for collodion emulsion is the following, worked out by the Bolt Court School of Photo-Engraving, London:—

Glycin	190 grs.	17 gms.
Sodium sulphite . .	1 oz.	40 gms.
Potass. carbonate	2 ozs.	80 gms.
Water to	25 ozs.	1,000 c c.s.

Intensifying Solution for Collodion Emulsion.

Silver nitrate	60 grs.	70 gms.
Citric acid	30 grs.	35 gms.
Nitric acid	30 minims	35 c.c.s.
Water	2 ozs.	1,000 c.c.s.

To each drachm of a three-grain solution of pyrogallic acid add 2 or 3 minims of the above, and apply until sufficient density is attained.

Hubl's Chlor-Bromide Collodion Emulsion.

Special for Colour Work.

A.—Silver nitrate	480 grs.	50 gms.
Hot distilled water .. .	1 oz	50 c.c.s.
Dissolve and add		
Alcohol	2 ozs.	100 c.c.s.
Nitric acid	6 drops	10 drops
Shake well, and add to		
4 per cent. collodion	10 ozs.	500 c c.s.

Shake till any precipitated pyroxyline is redissolved, and then add in small quantities

Zinc bromide (pure anhydrous)	307 grs.	32 gms.
Absolute alcohol	2¾ ozs.	128 c.c.s.
Shaking between each addition; then add		
Nitric acid	24 minims	1·5 c.c.s.
Hydrochloric acid . ..	24 minims	1·5 c.c.s.

This should be gently warmed before adding to the collodion. Allow to stand for twenty-four to thirty-six hours, or till the emulsion appears a greyish-violet by transmitted light, then add

Zinc chloride (pure anhydrous) ..	77 grs.	3.2 gms.

or sufficient to convert the whole of the uncombined silver nitrate into chloride, which can be tested for with potassium chromate. It

is advisable to dissolve the zinc chloride in about four times its volume of acid. The emulsion should then be precipitated by pouring into plenty of water, the threads collected and shaken up with alcohol and drained, and then dissolved in

Absolute alcohol	10 ozs.	500 c.c.s.
Ether, washed	10 ozs.	500 c.c.s.

Stripping Wet Collodion Negatives.

When the negative is thoroughly dry and cool, flow over with thin solution of rubber in benzole, 2 parts pure rubber to 100 parts benzole, or ordinary cycle tyre repairing solution thinned down to about the consistency of collodion will do. When this is dry, the negative is flowed over with "leather" collodion. This is prepared by adding a small quantity of castor oil to plain collodion. A good formula is as follows:—

Celloidin	½ oz.	2 gms.
Ether	5 ozs.	50 c.c.s.
Alcohol	5 ozs.	50 c.c.s.
Castor oil	½ oz.	2 c.c.s.

When the collodion on the negative is dry (and the drying can be hastened by heat) the negative is cut round the edges with a knife and placed in a dish of cold water. The film should soon begin to loosen at the edges; if it does not a little acetic acid (up to 10 per cent.) may be added to the water. The film is now transferred to a piece of paper, and thence to the new support. If the negative is to be reversed it is transferred to another piece of paper before being placed on its final support.

PLAIN AND ALBUMEN PAPERS.

Plain Paper.

Prepare the plain paper with—

Ammonium chloride	60—80 grs.	14—18 gms.
Sodium citrate	100 grs.	23 gms.
Sodium chloride	20-30 grs.	4·5-7 gms.
Gelatine	10 grs.	2 gms.
Distilled water	10 ozs.	1,000 c.c.s.

or—

Ammonium chloride	100 grs.	23 gms.
Gelatine	10 grs.	2 gms.
Water	10 ozs.	1,000 c.c.s.

The gelatine is first swelled in cold water and then dissolved in hot water, and the remaining components of the formula are added. The solution is filtered, and, when still warm, the paper floated upon it for three minutes.

The salted paper is sensitised upon a neutral 45-grain silver bath.

PLATINUM TONING BATH.

Potass. chloroplatinite	4½ grs.	1 gm.
Water	10 ozs.	1,000 c.c.s.
Nitric acid	2-3 drops.	5-10 drops.

Albumen Paper.

SILVER BATH.

Silver nitrate	600 grs.	140 gms.
Distilled water	10 ozs.	1,000 c.c.s.

The bath is made just acid with nitric acid, requiring three or four drops per 10 ozs

TONING BATHS.

No. 1.—Gold chloride	1 gr.	0·3 gm.
Sodium acetate	30 grs.	6 gms.
Water	8 ozs.	1,000 c.c.s.

This must not be used till one day after preparation. It keeps well and gives warm, rich tones.

No. 2 —Gold chloride	15 grs.	1 gm
Water	4 ozs.	120 c.c.s.

Add lime water until a piece of red litmus paper, placed in the solution, is turned blue. Then add —

Calcium chloride, fused	120 grs.	7·7 gms.
Water to make	7½ ozs.	115 c.c.s.

This solution is diluted with 15 times its volume of water to make the toning bath; it can be used over and over again by addition of stock solution

PRESERVATIVE FOR SENSITISED ALBUMEN PAPER.

Sensitise the paper in the usual bath, drain well, and when superficially dry float the back of the paper for twenty minutes on a solution of—

Citric acid	1 oz.	33 gms
Water	30 ozs.	1,000 c.c.s

TO PREVENT BLISTERS IN ALBUMEN PRINTS.

Before wetting the prints immerse them in methylated spirit, then wash and tone as usual

GELATINE P.O.P.

Emulsion Formulæ.

BARKER'S.

Gelatine (Nelson's No. 1 and Coignet's, equal parts).. ..	175 grs.	80 gms.
Ammonium chloride	18 grs.	8 gms.
Rochelle salts	50 grs.	23 gms.
Silver nitrate	75 grs.	34 gms.
Alcohol	4 drs.	160 c.c.s.
Water	5 ozs.	1,000 c.c.s.

Heat to 100 degrees F. (38 degrees C.), and allow to remain at this temperature after all is dissolved for ten minutes, after which proceed in the usual way.

VALENTA'S.

A.—Silver nitrate	.. .. ..	480 grs.	32 gms.
Citric acid	.. ..	120 grs.	8 gms.
Hot water	.. ..	$5\frac{1}{4}$ ozs.	160 c.c.s.
B.—Gelatine	.. ..	1,440 grs.	96 gms.
Ammonium chloride	. ..	42 grs.	2·8 gms.
Water	.. ..	24·3 ozs.	700 gms.
C.—Tartaric acid	.. .. ..	42 grs.	2·8 gms.
Sodium bicarbonate	.. ..	21 grs.	1·4 gm.
Alum	.. ..	27 grs.	1·8 gm.
Water	.. ..	5 ozs.	140 c.c.s.

Allow the gelatine to swell in the water and melt by the aid of heat, and add the chloride. Mix B and C at 50 degrees C., and in yellow light add A, heated to the same temperature, in small quantities, shaking thoroughly, and allow the emulsion to ripen for a short time at from 40 degrees to 50 degrees C. and then filter For matt surface papers the gelatine should be reduced to 754 grs. or 80 gms.

The above formula gives vigorous brilliant prints, but for soft negatives a harder printing emulsion is obtained by adding from 0 05 to 0·1 per cent. of calcium bichromate solution; this can be made by dissolving 480 grs or 25 gms. of pure chromic acid in 4 ozs. or 100 c c s. of distilled water, and adding sufficient pure chalk (calcium carbonate) to make the solution cloudy. The solution should then be filtered, and the filter washed with distilled water up to 4 ozs. or 100 c.c.s.

BEADLE'S.

Nelson's gelatine	.. .. ..	340 grs.	112 gms.
Alum	.. ..	15 5 grs.	5 gms.
Water	.. ..	$6\frac{1}{4}$ ozs.	900 c.c.s.
Rochelle salts	.. .. ..	15 5 grs.	3·5 gms.
Ammonium chloride	.. ..	11 grs.	5 gms
Heat to 50 degrees C., and add—			
Silver nitrate	.. .. ..	115 grs	37·5 gms
Citric acid	.. ..	62 grs.	20 gms.
Water	.. ..	1 oz.	100 c c.s.

Gold Toning Baths.

SULPHOCYANIDE.

Gold chloride	.. .. ..	$2\frac{1}{4}$ grs.	0 3 gm
Ammonium sulphocyanide	..	30 grs.	3 5 gms
Water	.. ..	20 ozs.	1,000 c c.s.

It is necessary for this and all sulphocyanide baths to ripen. The best method of mixing is to boil the water and to dissolve the gold in one half and the sulphocyanide in the other—both scalding hot

Then pour the gold into the sulphocyanide in small doses, stirring all the time: use when cool If cold water is used, the mixture should be allowed to stand 12 hours.

FORMATE.

Gold chloride	.. .. ..	1 gr.	0·12 gm.
Sodium bicarbonate	.. ..	2 grs	0·23 gm
Sodium formate	.. .. ..	8 grs	0·9 gm
Water	.. ..	20 ozs.	1,000 c.c.s.

The prints should be immersed in a 10 % solution of salt and water before using this bath.

TUNGSTATE.

Sodium tungstate	.. .. ..	30 grs.	3·5 gms.
Sodium carbonate	.. .. ..	1 gr.	0·12 gm.
Gold chloride	.. .. ..	1 gr.	0·12 gm.
Water	.. ..	10-20 ozs.	500-1,000 c.c.s.

CONCENTRATED SULPHOCYANIDE.

(Buhler's Formula.)

A.—Distilled water	.. .. ..	1 oz.	150 c.c.s.
Gold chloride	.. .. ..	15 grs.	5 gms.
B.—Strontium chloride	. ..	150 grs.	50 gms.
Distilled water	.. .. ..	¾ oz.	100 c.c.s.
C.—Potassium sulphocyanide	..	80-150 grs.	25-50 gms
Distilled water	.. .. ..	1¾ oz.	250 c.c s.

Heat B to boiling, and add A (heated to 150 degrees F.) in small doses. Bring C to boiling, and allow to cool to 205 degrees F., and add the hot mixture of A and B in four or five lots with constant stirring; cool and filter. If a precipitate forms, reheat to nearly boiling, wash the filter with ¾ oz. (100 c.c.s.) water, and add this latter to the total bulk. The bath is diluted with 10 times its volume of water for use.

THIOCARBAMIDE.

Gold chloride	.. .. ..	4 grs.	0·25 gm.
Distilled water	.. .. ..	1 oz.	25 c.c.s.

Add, to dissolve precipitate first formed, sufficient of—

Thiocarbamide	.. .. ..	90 grs.	1 gm.
Distilled water	.. .. ..	10 ozs.	50 c.c.s.

About ½ oz (14 to 15 c c.s.) will be needed. Next add—

Citric acid	.. ..	8 grs.	0·5 gm.

and

Distilled water to	.. .. .	35 ozs.	1,000 c.c.s.

and finally

Salt	.. ..	160 grs.	10 gms.

The prints should be thoroughly washed *before* as well as after fixing.

SHORT STOP FOR GOLD TONING.

A weak solution of sodium sulphite (5 grs. per oz) at once arrests the action of a gold toning bath.

SALT BATH.

A short immersion of prints in the following bath prior to the first washing favours even toning and prevents spots and stains from rusty tap water :—

Salt	2 oz	100 gms.
Sodium carbonate	1 oz.	50 gms.
Water	20 oz	1,000 c.c.s.

If prints are to be toned in the platinum bath the carbonate should be omitted.

Platinum Toning Baths.

PHOSPHORIC ACID.

Potass. chloroplatinite	4 grs.	0 45 gm.
Phosphoric acid (sp gr. 1·12) ..	¾ oz. (fl.)	35 c.c s
Water to	20 oz.	1,000 c.c.s.

CITRIC ACID

Potass. chloroplatinite	4 grs.	0 45 gm
Sodium chloride (salt)	40 grs.	4·5 gms
Citric acid	50 grs.	5 8 gms.
Water to	20 oz.	1,000 c c s.

HADDON'S FORMULA.

Platinum perchloride	3 grs	0 2 gm
Sodium formate	100 grs.	6 5 gms.
Formic acid	30 minims	1·8 c.c
Water to	35 oz.	1,000 c.c s.

SHORT STOP FOR PLATINUM TONING.

A weak solution of sodium carbonate (10 grs. per oz.) instantly arrests the toning action of a platinum bath

FOR BLACK TONES.

Tone in— (*Valenta*)

Potass. chloroplatinite	2¼ to 10 grs	0 5 to 2 gm.
Metaphenylene-diamine	2¼ to 10 grs.	0 5 to 2 gm.
Water	10 oz.	1,000 c.c.s.

having first washed the prints well.

Another method is to print deeply and immerse the prints in—

Salt	1 oz.	25 gms
Sodium bicarbonate	80 grs.	9 gms.
Water	20 oz	1,000 c.c s.

then wash well and tone in a borax gold bath to a purple red. Again well wash and tone in the phosphoric platinum bath

FOR RED.

(*Valenta.*)

Uranium nitrate	10-20 grs	1-2 gms
Thiosinamine	90 grs.	10 gms.
Water	20 ozs	1,000 c.c s.

The prints are well washed, finally in water acidulated with acetic acid, and then toned. They are afterwards fixed, or can be toned to sepia brown in the combined bath.

GOLD-PLATINUM (One Solution).

Citric acid	90 grs.	10 gms.
Salt..	90 grs.	10 gms.
Potass. chloroplatinite	4-8 grs.	½-1 gm.
Gold chloride	4-8 grs.	½-1 gm.
Water	20 ozs.	1,000 c.c.s.

Twice the amount of water may be used if the bath acts too quickly. If the proportion of gold to platinum is increased the tone is warmer. The prints must be well washed before fixing.

Combined Baths.

VALENTA'S.

Hypo	8 ozs.	400 gms.
Ammonium sulphocyanide ..	1 oz.	50 gms.
Lead nitrate	175 grs.	20 gms.
Alum	350 grs.	40 gms.
Water to	20 ozs.	1,000 c.c.s.

Dissolve the hypo in the water, add the sulphocyanide, then add the alum dissolved in a little water, and also the lead, and add to the hypo. Heat the mixture to 120 deg. F. for ten minutes; allow to cool. For use take—

Stock solution (as above) ..	10 ozs.	100 c c.s.
Water	10 ozs.	100 c.c.s.
Gold chloride (from stock sol.)..	3½ grs.	0·23 gm.

ALKALINE TONING AND FIXING BATH.

Gold chloride	2 grs.	0·23 gm.
Lead nitrate	10 grs.	1·2 gm.
Chalk	½ oz.	25 gms.
Hypo	4 ozs.	200 gms.
Water	20 ozs.	1,000 c.c.s.

Shake the solution well, allow to settle, and use the clear portion.

Reducer for Over-Printed Proofs.

A.—Ammonium sulphocyanide .. .. .. 10% sol.
B.—Potass. ferricyanide .. .. 10% sol.

A, 5 ozs.; B, ½ oz.; water, 24 ozs.

This is used on the prints after toning, fixing and well washing out the hypo in the usual way.

Developing P.O.P.

DIRECT PROCESS WITH ACID DEVELOPER.

Hydroquinone	16 grs.	18·5 gms.
Citric acid	40 grs.	4·6 gms.
Sodium acetate	1 oz.	50 gms.
Water	20 ozs.	1,000 c.c.s.

Immerse the dry prints in the developer, and, after development, wash in plenty of water for ten or fifteen minutes, then tone in the usual way.

Pyro (Blacklock).

A.—Pyro	..	40 grs.	4·6 gms.
Tartaric acid	..	40 grs.	4·6 gms.
Water	..	20 ozs.	1,000 c.c.s.

Will keep three or four weeks.

B.—Potass. bichromate	..	1/16 gr.	0·009 gm.
Water	..	16 ozs.	1,000 c.c.s.

B is best made up from a stock solution of 1 gr. per ounce, adding ½ dr. of it to 16 ozs. of water. To develop, mix equal parts of A. and B.

Six or seven inches of magnesium ribbon burnt close to the frame will suffice for the exposure.

The fixing bath is:—

Hypo	..	3½ ozs.	160 gms.
Lead acetate	..	200 grs.	23 gms.
Water	..	20 ozs.	1,000 c.c.s.

in which the prints lose very little.

PAGET "BROMIDE" PROCESS.

The prints are immersed in 10 per cent. potass. bromide solution for five or ten minutes, washed and developed with the following:—

A.—Hydroquinone	..	40 grs.	4·5 gms.
Sodium sulphite	..	160 grs.	18 gms.
Water to	..	20 ozs.	1,000 c.c.s.
B.—Potass. bromide	..	2½ ozs.	125 gms.
Sodium carbonate	..	2 ozs.	100 gms.
Water to	..	20 ozs.	1,000 c.c.s.
C.—Potass. cyanide	..	½ oz.	25 gms.
Water	..	20 ozs.	1,000 c.c.s.

For average negatives, mix:—A, ½ oz.; B, 1 oz.; C, 20 minims; water, ½ oz.

For flat negatives (greater contrast), A, 3 drs.; B, 1 oz.; water, 5 drs.

For hard negatives (soft results), A, 7 drs.; B, 1 oz.; water, 1 dr.

The cyanide solution is used as above in quantity sufficient to keep the backs of prints clean.

Glazing P.O.P.

POLISH FOR SQUEEGEEING GLASSES.

A polishing medium to be applied to glass or ferrotype before squeegeeing the print is—

Beeswax	..	20 grs.	45 gms.
Turpentine	..	1 oz.	1,000 c.c.s.
or			
Spermaceti wax	..	20 grs.	45 gms.
Benzole	..	1 oz.	1,000 c.c.s.

a few drops of which are rubbed on with a piece of flannel, and the glass afterwards polished with silk rag or chamois leather.

ENAMEL COLLODION.

Soluble gun cotton	50 grs.	14 gms.
Alcohol	4 ozs.	500 c.c.s.
Sulphuric ether	4 ozs.	500 c.c.s.

Glass plates cleaned with French chalk are coated with the above, and, as soon as coating has set, slip under prints which are waiting face down in water. Prints are withdrawn, squeegeed, and when half dry given a backing paper. (For both gelatine and collodion prints.)

COLLODIO-CHLORIDE P.O.P.

Emulsion Formula.

(*Valenta.*)

1.—Strontium chloride	154 grs.	10 gms.
Lithium chloride	77 grs.	5 gms.
Water	500 minims	30 c.c.s.
Alcohol (absolute)	930 minims	55 c.c.s.
2.—Silver nitrate	400 grs.	20 gms.
Water	500 minims	30 c.c.s.
Alcohol	1,000 minims	60 c.c.s.
3.—Citric acid	77 grs.	5 gms.
Alcohol	675 minims	40 c.c.s.
Glycerine	92 grs.	6 gms.

In a bottle capable of holding 1,000 parts pour 350 parts of 3 per cent. collodion and add gradually 15 parts of No. 1. Then in the dark room add almost drop by drop 60 parts of No. 2, shaking well after each addition; then add 50 parts of No. 3 and 50 parts of ether. This collodion is suitable for normal negatives, but more contrast can be obtained if 0·1 to 0·4 per cent. calcium chromate solution is added. By reducing the amount of pyroxyline in the above formula the emulsion is more suitable for matt surface paper.

Gold Toning Baths.

BORAX-ACETATE.

Borax	90 grs.	10 gms.
Sodium acetate	90 grs.	10 gms.
Gold chloride	2½ grs.	0·3 gm.
Water	20 ozs.	1,000 c.c.s.

SULPHOCYANIDE.

Ammonium sulphocyanide ..	90 grs.	10 gms.
Gold chloride	2½ grs.	0·3 gm.
Water	20 ozs.	1,000 c.c.s.

For bluish-black tones.

SULPHOCYANIDE-ACETATE.

Ammonium sulphocyanide ..	35 grs.	4 gms.
Sodium acetate	¾ oz.	45 gms.
Gold chloride	5 grs.	0·6 gm.
Water	20 ozs.	1,000 c.c.s.

Is made up one hour before using, preferably from stock solutions of the substances. With sodium tungstate, instead of the acetate, gives fine chestnut tones.

The maker's formulæ should be studied in connection with the above baths as papers differ considerably in the quantity of gold required in the toning solution.

Platinum Toning Baths.

The phosphate formula given below under "Gold Platinum Toning" is suitable for the production of the warm brown and sepia tones, which are given by the platinum baths alone. Others are :—

Citric acid	45 grs.	5 gms.
Potass. chloroplatinite	4 grs.	0·5 gm.
Water	20 ozs.	1,000 c.c.s.

Lactic acid (specific gravity 1·21)	25 grs.	3 gms.
Potass. chloroplatinite	4 grs.	0·5 gm.
Water	20 ozs.	1,000 c.c.s.

SALT-BICARBONATE BATH.

The following is used between washing and toning with the patinum bath as a means of removing free silver, and bringing the prints into a state of regular neutrality :—

Salt	½ oz.	25 gms.
Sodium bicarbonate	45 grs.	5 gms.
Water	20 ozs.	1,000 c.c.s.

Gold-Platinum Toning.

For Black Tones.

The following is the usual practice in toning collodion prints :—

Wash in several changes, and tone the shadows to a brown (when seen by transmitted light) in the following :—

Borax	90 grs.	10 gms.
Gold chloride	2 grs.	0·2 gm.
Water	20 ozs.	1,000 c.c.s.

This bath is ready within a few minutes of mixing. It is conveniently made just before washing the prints. The quantity of borax is adjusted to the working. If the lighter tones disappear, add more borax; if the prints lack brilliance, add gold. After a ten-minute wash, transfer to the platinum bath, which may be strong or weak,

the only difference being that a larger number of prints may be treated together in the weaker bath.

Stock solution.—

Potass. chloroplatinite	30 grs.	7 gms.
Phosphoric acid (specific gravity 1·12)	5 drs.	30 c.c.s.
Water to make	20 ozs.	1,000 c.c.s.

This may be made up to 60 ozs. at once, or added little by little to water, as the prints are passed through a few at a time.

The prints are next washed in about eight changes of water (to the fifth or so of which it is well to add a little of bicarbonate of soda to neutralise traces of acid) before fixing.

For Warm Sepia Tones.

The prints are washed in three changes of warm water and placed in :—

Ammonia	1 dr.	6 c.c.s.
Warm water	20 ozs.	1,000 c.c.s.

until they become lemon yellow. They are then again washed in three changes of water and toned for about one minute in the gold borax bath above.

For Red Chalk Tones.

The prints are washed in a couple of changes of water and placed for about half an hour (until they become orange-yellow) in :—

Salt..	1 oz.	50 gms.
Water	20 ozs.	1,000 c.c.s.

After which they are washed for about one minute and toned, for a few seconds only, in the borax bath above.

For Violet Tones.

Print deeply from the negatives and tone until the colour desired is reached in :—

Hydrochloric acid	6 ozs.	300 c.c.s.
Gold chloride	10 grs.	1·2 gm.
Water to make	20 ozs.	1,000 c.c.s.

After which wash thoroughly and fix in 5 per cent. hypo. Less acid in the above bath tends to bluish-violet, more to violet purple.

Combined Baths.

Collodion papers, although not generally so suitable for use with the combined bath, may in many cases be toned in it. The Valenta formula (see "Gelatine P.O.P." above) is suitable, also the following (Kurz) :—

Water	20 ozs.	1,000 c.c.s.
Hypo	5 ozs.	250 gms.
Ammonium sulphocyanide ..	240 grs.	28 gms.
Alum	70 grs.	7·5 gms.
Citric acid	70 grs.	7·5 gms.
Lead nitrate	90 grs.	10 gms.
Lead acetate	90 grs.	10 gms.
Gold chloride	$3\frac{1}{2}$ grs.	0·4 gm.

It is turbid when first made, but clears after a few days.

BROMIDE AND GASLIGHT PAPERS.

The following developers are a few only of the standard. The "Makers' Formulæ" should be consulted.

Amidol.

Sodium sulphite	650 grs.	74 gms.
Potass. bromide	10 grs.	1·2 gm.
Water	20 ozs.	1,000 c.c.s.
When dissolved add—		
Amidol	50 grs.	5·7 gms.

This developer will not keep more than three days.

See also the formula given under "Negative Developers."

The most convenient and economical method of using amidol developer for bromide papers is to make up a 10 per cent. stock solution of sodium sulphite, and add 5 grs. potassium bromide to each 10 ozs. solution. For use add 4 grs. dry amidol to each ounce stock solution, and dilute with an equal bulk of water.

Eikonogen-Hydroquinone.

(See under "Developers and Development.")

Metol.

A.—Metol	100 grs.	11·5 gms.
Sodium sulphite	2 ozs.	100 gms.
Potass. bromide	12 grs.	1·4 gm.
Water	20 ozs.	1,000 c.c.s.
B.—Potass. carbonate	2 ozs.	100 gms.
Water	20 ozs.	1,000 c.c.s.

For use take 3 ozs. of A and 1 oz. of B.

For gaslight papers use half the quantity of water in above formula.

Metol-Hydroquinone.

Metol	8 grs.	1 gm.
Hydroquinone	30 grs.	3·5 gms.
Sodium sulphite	¾ oz.	37·5 gms.
Sodium carbonate	¾ oz.	37·5 gms.
10% solution of potass. bromide	20 minims	2·5 c.c.s.
Water	20 ozs.	1,000 c.c.s.

For gaslight papers make up above formula with 10 ozs. of water.

Rodinal.

Rodinal	100-150 minims	6-9 c.c.s.
Water	10 ozs.	300 c.c.s.
10% solution of potass. bromide	20 minims	1 c.c.

Ortol.

A.—Ortol	..	120 grs.	14 gms.
Potass. metabisulphite ..	..	60 grs.	7 gms.
Water	..	20 ozs.	1,000 c.c.s.
B.—Sodium sulphite	..	4 ozs.	200 gms.
Potass. carbonate	..	1 oz.	100 gms.
Potass. bromide	..	20 grs.	2·3 gms.
Water	..	20 ozs.	1,000 c.c.s.

Use equal parts of A and B.

For gaslight papers use half the quantity of water given in this formula.

Ferrous Oxalate.

A.—Sulphate of iron	..	5 ozs.	250 gms.
Sulphuric acid	..	30 minims	3 c.c.s.
Warm water to	..	20 ozs.	1,000 c.c.s.
B.—Potass. oxalate (neutral)..	..	5 ozs.	250 gms.
Potass. bromide	..	10 grs.	1·2 gm.
Warm water to	..	20 ozs.	1,000 c.c.s.

For use add 1 oz. of A to 4 ozs. of B, not *vice versâ*.

After development and without washing, immerse the prints for two minutes in acid bath, pour off and repeat.

Acid Bath.

Glacial acetic acid ..	..	1 dr.	6 c.c.s.
Water	..	20 ozs.	1,000 c.c.s.

Then wash thoroughly to remove last trace of acid.

Clearing Bath.

To remove yellow stain from bromide prints, the following is suitable:—

Alum (saturated solution)	..	10 ozs.	1,000 c.c.s.
Hydrochloric acid ..	..	3 drs.	40 c.c.s.

Reducer for Bromides.

Over-developed prints are best treated in a weak iodine-cyanide reducer made from (A) 10% solution of iodine in potass. iodid and (B) 10% potass. cyanide solution. Take:—

A.	..	30 minims	2 c.c.s.
B.	..	10 minims	0·6 c.c.
Water	..	2 ounces	60 c.c.s.

Adding more of A and B if necessary.

Strong Prints from Flat Negatives.

The prints are fully exposed and over-developed, fixed and washed, They are then placed in the following iodine bath until whites are strongly blue, and then fixed for five minutes.

IODINE BATH.

Potass. iodide	30 grs	7 gms.
Iodine	3 grs.	0 7 gm.
Water	10 ozs.	1,000 c.c.s.

If not sufficiently lightened, the print may be washed and the process with bleaching bath and hypo repeated.

Hypo-Alum Toning.

Hot water	20 ozs.	1,000 c.c.s
Hypo	$2\frac{1}{2}$ ozs.	125 gms.

Dissolve and add—

Alum	$\frac{1}{2}$ oz.	25 gms.

This solution should not be filtered, and it works better as it becomes older; it may be strengthened from time to time with a little fresh solution.

The best results are obtained by keeping the bath hot, or as warm as the emulsion will stand, say 100 to 120 degrees F. In this bath prints will tone in 30 to 40 minutes. When this toning bath is to be employed, the use of the alum bath after fixing is absolutely essential. Moreover, the prints should not, in this case, be subjected to a prolonged washing, but should only be slightly rinsed before being dried

A new bath tends to reduce the prints rather more than an old one. When toned the prints should be placed in a tepid solution of—

Water	70 ozs.	1,000 c.c.s.
Alum	2 ozs	30 gms.

and then washed thoroughly.

Sulphide Toning.

BLEACHER.

Ammonium bromide	100 grs.	11 gms
Potass. ferricyanide	300 grs	35 gms.
Water	20 ozs.	1,000 c.c s.

SULPHIDE BATH.

It is best to keep the sulphide in strong, 20 per cent., solution, a weak solution does not keep well. Use the pure *white* sulphide, dissolving 4 ozs. in water and making up to 20 ozs

To make the working sulphide bath, mix:—

Stock 20% sulphide solution	.. .. ..	3 ozs.
Water to make	.. ..	20 ozs

The prints are treated for two or three minutes in the bleacher—that is until the picture becomes faint brown in colour. If any black is left at the end of two minutes it is a sign that the bleacher (which may be used repeatedly) is becoming exhausted.

Rinse in clean water for half-a-minute to one minute. Longer washing at this stage does no good and may lead to impaired tone.

Transfer to sulphide bath where prints should darken to the full brown or sepia in a second or two.

Throw away the sulphide bath after the day's use. Stale spoilt sulphide solution is the most frequent cause of bad tones or of refusal of prints to darken in the sulphide bath.

Finally wash for half-an-hour in running water.

Copper Toning.

A.—Copper sulphate	.. .. ..	60 grs	7 gms.
Potass. citrate (neutral)	.. ..	240 grs	28 gms.
Water	.. ..	20 ozs.	1,000 c.c s.
B.—Potass. ferricyanide	.. ..	50 grs.	6 gms.
Potass. citrate (neutral)	.. ..	240 grs.	28 gms.
Water	.. ..	20 ozs.	1,000 c c.s.

Use equal parts of each. Warm black to red chalk tones are obtained as the action proceeds. If prints are pinkish in the high-lights, use more citrate in the A or B solution. Results permanent

Platinum Toning.

Not for Gaslight Prints.

Potass. chloroplatinite	.. ..	12 grs.	0 8 gm.
Mercuric chloride..	.. ..	6 grs	0·4 gm.
Citric acid ..	.. .. ..	54 grs.	3·4 gms.
Water	.. ..	6 ozs.	170 c c.s.

This bath should be made up fresh for use from stock solutions. Gives warm sepia tones, with slight staining of high-lights. For cold sepia tones and absence of staining add 30 minims 10 per cent solution potassium bromide to above. Wash well after toning.

Uranium Toning.

A.—Uranium nitrate ..	.. ..	90 grs.	10 gms.
Water	.. ..	20 ozs.	1,000 c.c.s.
B.—Potass. ferricyanide	.. ..	90 grs.	10 gms.
Water	.. ..	20 ozs.	1,000 c.c.s.

Use equal parts of A and B, and add 20 minims of glacial acetic acid to each ounce of mixture. The prints must be free from hypo.

After toning wash in several changes of *still* water till the high-lights are clear. Washing in running water will remove the toning in patches. Citric acid (10 grs. per oz.) or oxalic acid (5 grs. per oz.) instead of acetic is an aid to pure whites This bath intensifies the image . the results often prove impermanent.

Green Tones.

Vanadium chloride	20 grs	1 gm
Ferric chloride	10 grs.	0 5 gm.
Ferric oxalate	10 grs.	0·5 gm.
Potassium ferricyanide	20 grs.	1 gm.
Oxalic acid (sat. sol.)	2½ ozs.	60 c.c.s.
Water to	20 ozs.	1,000 c.c.s.

Dissolve the vanadium salt in hot hydrochloric acid and a little water. Add the ferric chloride and oxalate to the oxalic acid solution diluted with half the water, then add the ferricyanide dissolved in water, stirring well, and finally the vanadium. Tone till the prints turn blue, and then wash till they are green. Yellowish stain of the whites is removed by a weak (2 grs. per oz) solution of ammonium sulphocyanide.

Blue Tones.

10% solution ferric ammonium citrate	2 ozs	10 c c s.
10% solution potassium ferricyanide	2 ozs.	10 c.c.s.
10% solution acetic acid.. ..	20 ozs.	100 c.c s.

The well-washed prints are immersed in this bath until the desired tone is given. Then well wash until high-lights are clear. This bath intensifies the image.

Gold Toning.

Ammonium sulphocyanide ..	30 grs.	2 gms.
Chloride of gold	2 grs.	0·13 gm.
Boiling water	4 ozs.	110 c.c.s.

Use as soon as cool. Place the wet print face upwards on a sheet of glass, squeegee into contact, blot off superfluous moisture, and paint the above bath on with a broad flat brush; when the desired tone is reached wash well and dry. This considerably improves the colour of greenish or rusty black prints, and if allowed to act for some time bluish tones are obtained.

Practically all the above toning solutions can be employed for lantern plates.

Line Drawings from Bromide, Gaslight, or P.O.P. Prints.

After outlining the subject in waterproof Indian ink, bleach out the image in—

Thiocarbamide	240 grs.	25 gms.
Nitric acid	4 drs. (fl.)	25 c.c.s.
Water	20 ozs.	1,000 c.c.s.

Or in—

Iodine sol. (10 per cent. in potass. iodide sol.)	30 minims	6 c.c.s.
Potass. cyanide (10 per cent. sol. in water)..	5 minims	1 c c.
Water	1 oz.	100 c.c.s.

THE CARBON PROCESS.

Sensitising Solutions.

Potass. bichromate	1 oz.	35-50 gms.
Water	20-30 ozs.	1,000 c.c.s.
Liquor ammonia (0·880).. ..	60 minims	6 c.c.s.

A longer immersion in the weaker solution is practically equal to a shorter one in the stronger bath.

If the tissue is squeegeed on a glass plate after sensitising, the degree of squeegeeing (light or heavy) also modifies its sensitiveness by removing more or less of the solution. If the tissue be squeegeed on to a ferrotype plate, and allowed to dry upon it, the drying may be done in the light of an ordinary room. The face of the tissue is then protected from light, dust, and injurious vapours.

The following has been recommended.—

Potass. bichromate	1 oz.	20 gms.
Water	50 ozs.	1,000 c.c.s.
Citric acid	¼ oz.	5 gms.
Liquor ammonia	q.s. to change tint of solution to lemon yellow.	

This bath is suitable for thin negatives, *i.e.*, those lacking in contrasts, and the tissue sensitised in it will keep longer than that sensitised in the former solution. The tissue, however, is much less sensitive, and with vigorous or contrasty negatives, such as are best suited for carbon work, it is apt to yield prints that are hard, through the washing away of the more delicate tones in the development.

Waxing Solutions.

FOR CARBON PRINTS, OR FOR REMOVING COLLODION FILMS.

No 1.—Beeswax	.. .. ..	20 grs.	10 gms.
Benzole rect. No. 1	.. ..	4 ozs.	1,000 c.c.s.

FOR FLEXIBLE SUPPORTS (AUTOTYPE).

No 2.—Yellow resin	.. .. ..	180 grs.	42 gms.
Yellow beeswax	.. ..	60 grs.	14 gms.
Rectified spirits of turpentine		10 ozs.	1,000 c.c.s.

FIXING OR HARDENING BATH.

Alum	. .. .	1 oz	50 gms.
Water	. .. ..	20 ozs.	1,000 c.c.s.

Gelatine Solutions.

For transferring carbon pictures from flexible support to ivory, opal, glass, &c

Nelson's No. 1 gelatine	.. ..	1 oz	50 gms.
Water	.. ..	1 pint	1,000 c.c s.
Chrome alum, dissolved in 2 ozs. (100 c.c.s.) hot water	.. ..	12 grs.	1 4 gm

For coating drawing-papers for the single transfer process—

Nelson's No 1 gelatine	.. ..	1 oz	50 gms.
Water	.. .. ..	1 pint	1,000 c.c s.
Chrome alum, dissolved in 2 ozs. (100 c c s) water	.. ..	20 grs.	2 3 gms

Apply with a brush

Note—In adding a solution of chrome alum to one of gelatine, both solutions should be at a fairly high temperature, 130 degrees to 160 degrees F.

SUBSTRATUM FOR CARBON TRANSPARENCIES

Nelson's No. 1 gelatine	.	¾ oz	37 gms
Water	.. .. ..	20 ozs	1,000 c c s
Potass bichromate	. .	12 grs	1 4 gm

Well cleaned plates are coated with this and dried, when they are fully exposed to light, which will render the coating insoluble.

TO REMOVE BICHROMATE STAINS FROM FINGERS, NAILS.

Apply dilute ammonia to the parts until the stains disappear, then well wash the hands with warm water and soap.

THE OIL PROCESS.

Double-transfer papers, as used in the carbon process or other papers (gelatine-coated) sold for the purpose, are sensitised in a solution of bichromate of potash of 5 per cent. strength as for carbon printing.

The citric acid sensitiser given above under "Carbon" is very suitable, but the most satisfactory method on the whole is the use of a quick-drying spirit sensitiser.

SPIRIT SENSITISER.

(*Demachy.*)

Prepare 6 per cent. ammonium bichromate by dissolving 1½ ozs. of this salt in 25 ozs. of water.

To make the sensitiser mix at time of use:—

Stock bichromate solution	1 part
Alcohol, pure, 90°	2 parts

The sensitiser is applied with a flat hog-hair brush, about ¾ oz. serving for six 10 × 8 sheets of transfer paper.

The paper dries in about 18 minutes, and is printed under the negative until it shows a brown image somewhat as in the platinotype process. The detail should show in the high-lights. It is then soaked in several changes of water to remove the yellow bichromate (about 20 minutes), and then soaked for a further time (in a dish of water), depending on the thickness of the gelatine coating. An average time is 30 minutes; 2 to 3 hours for more heavily coated papers. The temperature of the water should be between 65° and 70° F., and should be kept steady by placing the dish in a place at this temperature. The print can be pigmented forthwith, or dried for pigmenting later on. If it is dried it requires about an hour's soaking in water at 65° to 70° F. to bring it into the best condition for pigmenting.

THE BROMOIL PROCESS.

C. Welborne Piper's Formula.

The bromide enlargement must be fully exposed and developed, using a slow acting amidol developer for preference, and it must be thoroughly fixed, washed, and dried. It is then bleached in—

Ozobrome solution	4 parts
Potash alum, 10% solution	4 parts
Citric acid, 10% solution	1 part
Water to make	20 parts

It is washed and then immersed in sulphuric acid (1 part to 20 water) for from 2 to about 5 minutes, again washed by soaking for a few minutes, and then fixed for 2 or 3 minutes in—

Hypo	2 ozs.
Soda sulphite	½ oz.
Water to make	20 ozs.

After this it is washed again and then pigmented like an ordinary oil print. The solutions and washing water used should not be under 60 deg. or over 70 deg. F., and the preparation of the print should not occupy longer than 20 minutes.

The ozobrome solution used is that specially supplied for bromoil by the Ozobrome Company.

The above is the process originally published by Mr. Welborne Piper, and is still as reliable a method as any. For alternative bleachers, &c., which have been proposed, see "Epitome of Progress," B.J.A., 1909, p. 618; 1910, p. 871, and under "Bromoil" in the present volume.

PLATINUM PRINTING.

Sensitisers for Cold Bath Papers (Hübl).

Stock Solutions.

Standard Iron Solution.—In glass measure about 3 ins. diameter and 12 ins. high (marked to show a volume of 85 c.c.s.), place 52 gms. powdered iron ammonium alum, and add about 20 c.c.s. ammonia (0·880) and 20 c.c.s. water. Stir up the alum powder with a glass rod, and allow to stand several minutes, with frequent shaking. The whole should smell slightly of ammonia; if it does not a little more is added. The measure is then filled with water, the precipitate of ferric hydroxide stirred up, the glass rod removed, and the ppt. left to settle. The clear liquid is poured off, fresh water poured on, and the stirring and settling repeated until the solution no longer colours red litmus-paper blue. Powdered oxalic acid (21·5 gms.) is then dusted on the ppt., after pouring off the last washing water, and (in yellow light from this point) stirred in until the mixture clears. It is poured into a 100 c.c. measure, and diluted (with rinsings from the cylinder) to 100 c.c.s. Process occupies three to four hours.

Lead-Iron Stock Solution.—Dissolve lead acetate (10 gms.) in warm water (100 c.c.s.), and add oxalic acid (4 gms.) dissolved in a little water. A white precipitate of lead oxalate is produced, and is filtered, washed, and shaken up, with Standard Iron Solution in proportion of 1 gm. per 100 c.c.s. Finally, filter.

Oxalic-Gelatine Solution. — Soak gelatine (2 gms.) in water (20 c.c.s.), and add oxalic acid (½ gm.). Warm before use. Keeps only a day or two.

Stock Platinum Solution.—Potash chloroplatinate, 1 gm.; water, 6 c.c.s.

Mercury Citrate Solution.—Dissolve yellow mercuric oxide (1 gm.) in water, 20 c.c.s.; citric acid, 5 gms., warm and filter.

Sensitisers.

The quantities are for a 20 by 30 sheet. Water is added for medium (2 to 3 c.c.s.) and for rough (3 to 8 c.c.s.) papers.

A.—Lead-iron solution	4·5 c.c.s.
Stock platinum solution	3 c.c.s.

For black tones on gelatine-sized Rives papers.

B.—Lead-iron solution	.. ..	4·5 c.c.s.
Stock platinum solution	.. .. ..	·3 c.c.s.
Oxalic-gelatine solution	.. .. ..	1 c.c.

For blue-black tones on arrowroot-sized papers.

For more brilliant prints 5 to 10 drops of 10% solution of sodium chloroplatinate are added to either of the above.

Sepia Paper Sensitisers.

Hot Development.

Standard iron solution	.. ..	6 c.c.s.
Stock platinum solution	.. ..	4 c.c.s.
Mercuric chloride (1 in 20 solution)	.. ..	0·2 to 1 c.c.
Sodium chloroplatinate (10% solution)	..	2 to 10 drops.

Cold Development.

Standard iron solution	.. ..	8 c.c.s.
Stock platinum solution	.. ..	4 c.c.s.
Mercury citrate solution	.. ..	1 to 4 c.c.s.
Sodium chloroplatinate (10% solution)	..	2 to 5 drops.

For rough papers 2 to 4 c.c.s. of water are added.

Cold Bath Developers.

Potass. oxalate	2 ozs.	100 gms.
Potass. phosphate	1 oz.	50 gms.
Water	20 ozs.	1,000 c.c.s.

For Sepia Tones on Cold Bath Black Paper.

A.—Potass. oxalate	2 ozs.	20 gms.
Water	15 ozs.	150 c.c.s.
B.—Potass. citrate	160 grs.	23 gms.
Citric acid	250 grs.	39 gms.
Mercuric chloride	95 grs.	14 gms.
Water	15 ozs.	1,000 c.c.s.

Equal parts of A and B, used slightly warm. The prints are afterwards fixed in acid baths of one-third the usual strength.

Another Formula.

Prepare the following solutions :—

1.—Potass. oxalate	4 ozs.	250 gms.
Distilled water	16 ozs.	1,000 c.c.s.
2.—Cupric chloride	124 grs.	35 gms.
Distilled water	8 ozs.	1,000 c.c.s.
3.—Mercuric chloride	1 oz.	62 gms.
Distilled water	16 ozs.	1,000 c.c.s.
4.—Lead acetate	32 grs.	18 gms.
Distilled water	4 ozs.	1,000 c.c.s.

Mix 12 parts of No. 1 with 4 parts No. 2, then add 4 parts No. 3 and 1 part No. 4, and heat till the precipitate first formed is redis-

solved. The solution should be heated to 175 degrees F., and the prints developed in it in the usual way and treated to the usual acid clearing baths, then immersed in ammonia solution (about 10 minims per oz.) for five minutes, and washed and dried.

Developer for Sepia Paper.

HOT BATH.

Potass. oxalate	2 ozs.	100 gms.
Potass. phosphate..	1 oz.	50 gms.
Citric acid	180 grs.	20 gms.
Potass. chloride	90 grs.	10 gms
Water	20 ozs.	1,000 c.c.s.

RECOVERING OVER-EXPOSED PRINTS.

Immerse for about two minutes in the oxalate developer. Transfer for one second to a bath of 1 to 20 hydrochloric acid. Return to the developer, and treat as usual.

INTENSIFIER FOR PLATINUM PRINTS

A.—Sodium formate	45 grs.	100 gms
Water	1 oz.	1,000 c.c.s.
B.—Platinum perchloride	10 grs.	1 gm.
Water	1 oz.	45 c.c.s.

Add 15 minims each of A and B to 2 ozs. of water (3 c.c.s. to 100 c c.s.).

RESTORING YELLOWED PRINTS.

Shake up bleaching powder with about five times its weight of water, pass through a sieve, and to the portion which passes through add a little weak hydrochloric acid—enough to give the mixture a faint chlorine smell. The solution removes the yellow (iron) stain from platinum prints

CLEANING SOILED PRINTS.

Alum (one teaspoonful) is dissolved in about 8 ozs. of water, and mixed in a basin with a handful of flour to a cream-like consistency This mixture is applied to the platinum print with a soft brush, and washed off in running water.

PLATINUM RESIDUES.

Exhausted developers—the acid baths will not repay recovery—are mixed in a large jar, with zinc and hydrochloric acid (spirits of salt will do). A dirty chalk-like precipitate is accumulated, and the clear liquor is thrown away. The platinum is precipitated in the mud, and the latter, when enough has accumulated, is sent to the refiners, after being drained from water as much as possible on a linen cloth.

Waste prints, clippings from paper, etc., should be sent as they are or burnt to an ash in a place free from draught, such as a biscuit tin with a row of holes about half way up. They should not be mixed with the wet residues, as the two require different treatment for the extraction of the metal.

IRON PRINTING PROCESSES.

Ferro-Prussiate Sensitiser.

A.—Ferric ammonium citrate (green)*	..	110 grs.	250 gms.
Water	..	1 oz.	1,000 c.c.s.
B.—Potass. ferricyanide	..	40 grs.	90 gms.
Water	..	1 oz.	1,000 c.c.s.

Mix in equal parts, keep in the dark, and filter just before use.

The sensitiser is applied with a brush or sponge. The paper is printed until the shadows bronze, and is "developed" simply by soaking in one or two changes of plain water.

Solution for Writing Titles on, removing blue lines from blue prints, etc.—Potass. oxalate, 75 grs. per oz.; 170 gms. per 1,000 c.c.s.

Brightening the Colour.—Blue prints are improved in colour by a final bath of 2½ per cent. alum solution, 3 per cent. oxalic acid, or 1 per cent. hydrochloric acid.

The Kallitype Process.

SENSITISER.

Ferric oxalate	..	75 grs.	170 gms.
Silver nitrate	..	30 grs.	70 gms.
Distilled water	..	1 oz.	1,000 c.c.s.

The ferric oxalate is shaken up with the hot water and a grain or two of oxalic acid added to get it into solution. After filtering the silver is added and the solution stored in the dark.

Paper thus sensitised yields prints of full gradation and half-tone from ordinary negatives, such as print well in P.O.P. For flat negatives further bichromate solution may be used in the developer.

DEVELOPERS.

For Black Tones.

Borax	..	2 ozs.	100 gms.
Rochelle salt	..	1½ ozs.	75 gms.
Water	..	20 ozs.	1,000 c.c.s.
Potass. bichromate sol. (1%)	..	15 to 18 drs.	90 to 115 c.c.s.

For Purple Tones.

Borax	..	½ oz.	28 gms.
Rochelle salt	..	2 ozs.	100 gms.
Water	..	20 ozs.	1,000 c.c.s.
Potass. bichromate sol. (1%)	..	15 to 18 drs.	90 to 115 c.c.s.

For Sepia Tones.

Rochelle salt	..	1 oz.	50 gms.
Water	..	20 ozs.	1,000 c.c.s.
Potass. bichromate sol. (1 %)	..	8-10 drs.	50-60 c.c.s.

* If the ordinary brown citrate be used, the formula should contain 80 grs. (188 gms.), and the ferricyanide should be increased to 60 grs. (137 gms.).

For Black Tones.

Sodium acetate	.. .. ..	3 ozs.	150 gms.
Water	.. ..	20 ozs.	1,000 c.c.s.

From this developer prints must be passed into a bath of potass. oxalate (15 %) before fixing.

FIXING SOLUTION.

Hypo	.. ..	1 oz.	200 gms.
Ammonia (0·880)	.. .. ..	120 minims	12 c.c.s.
Water	.. ..	20 ozs.	1,000 c.c.s.

Sepia Paper.

A.—Ferric ammonia citrate (green)	..	110 grs.	250 gms.
Water	.. ..	1 oz.	1,000 c.c.s.
B.—Tartaric acid	.. .. ..	18 grs.	40 gms.
Water	.. ..	1 oz.	1,000 c.c.s.
C.—Silver nitrate	.. .. ..	45 grs.	100 gms.
Water	.. ..	1 oz.	1,000 c.c.s.
D.—Gelatine	.. ..	30 grs.	70 gms.
Water	.. ..	1 oz.	1,000 c.c.s.

Equal parts (say 1 oz. of each) of these solutions are mixed as follows:—D is rendered just fluid on a water bath, A and B added, and lastly C, a few drops at a time. The prints are fixed in 1: 50 hypo.

This process and the single-solution sensitiser given below may be used for printing from ordinary negatives, but the results are deficient in gradation. Both are excellent for making duplicates of plans, etc., and give a copy in white lines on a brown ground from an ordinary tracing. This copy may be used as a negative for preparing further "positive" copies.

One-Solution Sepia Sensitiser.

Silver nitrate	.. .. ..	55 grs.	3·5 gms.
Water	.. ..	4-5 drs.	15-20 c.c.s.

Add ammonia drop by drop to just redissolve the white precipitate, and then a little sulphuric (or citric) acid to just remove the odour of ammonia. Then add—

Ferric ammonium citrate (green)		40 grs.	2·5 gms.
Water	.. ..	6 drs.	25 c.c.s.

This solution keeps in the dark, and is used like the four-solution mixture.

Pellet Process.

A.—Pure gum arabic	.. .. ..	4 ozs.	200 gms.
Water	.. ..	20 ozs.	1,000 c.c.s.
B.—Ferric ammonium citrate	..	10 ozs.	500 gms.
Water	.. ..	20 ozs.	1,000 c.c.s.
C.—Ferric chloride (crystallised)	..	10 ozs.	500 gms.
Water	.. ..	20 ozs.	1,000 c.c.s.

Add 8 vols. of B, then 5 vols. of C to 20 vols. of A, in small doses with constant stirring.

The prints are developed on 10 per cent. solution of potass. ferrocyanide and "fixed" in 1 : 25 sulphuric acid (specific gravity 1·98).

The Pellet process is for copies of line drawings only. From an ordinary tracing it gives a copy in blue lines on a white ground.

The Ferro-Gallic Process.

Gum arabic	60 grs.	135 gms.
Warm water	1 oz.	1,000 c.c s.

When dissolved add the following in the order given:—

Tartaric acid	8 grs.	18 gms.
Salt	36 grs.	81 gms.
Ferric sulphate	40 grs.	90 gms.
Ferric chloride	60 grs.	135 gms.

The developer for the prints is:—Alum and gallic acid, 1 part of each; water, 80 parts.

This process is for line drawings only. It gives a copy, in bluish-black lines on a white ground, from an ordinary tracing

MOUNTANTS.

Starch Paste.

Pure starch is mixed with a very small proportion of cold water to form a very stiff mass. It should be so stiff that it is stirred with difficulty. Perfectly boiling water is then poured in, about 12 ozs. for every ounce of starch. On stirring the mixture will jellify without being boiled; but if it does not it is brought to the boil, cooled, the skin taken off, and the paste used on day of making.

Gelatine.

For mounting prints without cockling.

Nelson's No. 1 gelatine	4 ozs.	50 gms.
Water	16 ozs.	200 c.c.s.

Soften the gelatine in the water, liquefy on the water bath, and add a little at a time and stirring rapidly:—

Methylated spirit	5 ozs.	30 c.c.s.
Glycerine	1 oz.	6 c.c.s.

The mountant is used hot. A piece of ground glass is dipped in hot water, drained, and the mountant brushed over. The print is then laid face up on the pasted surface and rubbed gently in contact with a piece of paper, being then removed and pressed down on its mount.

Dextrine Paste.

Best white dextrine	1 lb.
Cold water	to make stiff paste
Water	10 ozs.
Oil of wintergreen	1 dr.

Mix the dextrine and water together in small doses of each, so as to ensure a mixture free from lumps and clots. Dilute with the further quantity of water, add the oil, and just bring the whole mixture to the boil, when it should be like clear gum. Pour into pots, cover up, and in from 12 to 24 hours it will be set to a hard and white paste of great adhesive power The dextrine must be the best white; inferior dextrine remains treacly on cooling.

Starch-Gelatine.

A.	-Bermuda arrowroot	8 ozs	200 gms.
	Water	4 ozs.	100 c.c s.
B	Nelson's No. 1 soft gelatine ..	360 grs.	10 gms.
	Water	64 ozs.	800 c.c s.

The gelatine is first softened in the water and A and B are then mixed together and boiled for a few minutes. To the cold mixture are stirred in--

Methylated spirit	5 ozs.	250 c c s.
Carbolic acid (liquid)	25 minims	3 c.c.s

This is a good cold paste, which sticks and keeps fairly well.

Liquid Gelatine.

Gelatine	1 oz.	100 gms
Water	6 ozs.	600 c c.s.
Chloral hydrate	1 oz.	100 gms.

The gelatine is dissolved in the water by aid of heat, and the chloral hydrate added After digesting for a short time the adhesive liquid is neutralised with a little sodium carbonate solution.

Gum-Dextrine.

Picked white gum arabic ..	½ oz.	65 gms
Dextrine	2¼ ozs.	280 gms.
Liquid ammonia	4 drops	50 c c.s.
Carbolic acid	1 dr	15 c c.s
Water	8 ozs.	1 000 c c.s.

The gum is powdered in a mortar and mixed intimately with the dextrine, and rubbed with 2 ozs. of water until a smooth mixture is obtained. The remainder of the water is added, and the whole boiled for 10 minutes. The ammonia and carbolic acid are added when cold. This mountant keeps well for months, and is smooth in working and of great adhesiveness.

Shellac Mountant.

A strong solution of shellac in methylated spirit, or, better, rectified spirit, is thinly applied to both mount and print, and the two coated surfaces quickly rubbed into contact. A good method of fixing prints to thin mounts in albums, etc.

Affixing Paper to Metal.

Tragacanth	3 ozs.	60 gms.
Gum arabic	12 ozs.	240 gms.
Water	50 ozs.	1,000 c.c.s.
or—		
Gum arabic ..	1 oz.	100 gms.
Aluminium sulphate	45 grs.	10 gms.
Water	10 ozs.	1,000 c.c.s.

Mounting on Glass (Opalines).

Nelson's No. 2 soft gelatine	2 ozs.	30 gms.
Water	20 ozs.	300 c.c.s.

The gelatine is soaked in the water, and liquefied by standing the vessel in hot water. The solution is thinned down until nearly as thin as water. Print and glass are immersed, removed together, and squeegeed together with flat rubber squeegee.

WORKING UP, COLOURING, ETC., PRINTS.

Lubricant for Burnishing Prints.

Powdered Castile soap	20 grs.	5 gms.
Alcohol	10 ozs.	1,000 c.c.s.

Encaustic Paste.

Purified beeswax	50 parts
Oil of lavender..	30 parts
Benzol	30 parts
Gum elemi	1 part

BASKETT'S FORMULA.

To the contents of a 2d. tin of Globe polish add 1 oz. best olive oil and 1 oz. terebine. Apply with soft cloth and polish.

Preparing Prints for Colouring.

P.O.P.'S AND GLOSSY BROMIDES.

Rub the prints lightly with a tuft of wool slightly moistened with artist's purified ox-gall. If they have been lubricated before burnishing apply previously a little alcohol in the same way.

COLLODION PRINTS.

Fluid extract of quillaia	1 dr.	5 c.c s.
Water	1 oz.	40 c.c.s.
Alcohol	1 oz.	40 c.c.s.

Bromides.

For Water Colouring.

Apply ox-gall as directed for P.O.P., or prepare as directed below for pastel work.

For Oil Colouring.

If the surface is clean no preparation is needed; if otherwise give a wash of gum, starch, or gelatine, or prepare with pumice powder. Also light drying oil (from the artists' colourman) may be rubbed over with a tuft of wool or the fingers. It dries in about twenty-four hours, and leaves the surface of the bromide ready for painting.

For working up in pastel or black and white, apply fine pumice powder with a tuft of wool, and *remove* with another piece of wool or a duster.

Fixatif for Crayon and Pastel Work.

A.—Mastic	24 grs.	1·6 gm.
Amyl acetate	3 ozs.	85 c.c.s.

Dissolve by agitation, and allow to stand some hours before use.

B.—Celluloid (film clippings free from emulsion will do)	7 grs.	0·45 gm.
Amyl acetate	3 ozs.	85 c.c.s.

Dissolve by agitation. Mix when both are clear, and keep in tightly-corked bottle. Apply with spray diffuser.

Colouring Prints with Dyes.

Dissolve the aniline colour (1d. packets of dye will do) in a sufficient quantity of water (from ½ to 1 oz. to a 1d. packet), and for glossy prints add a little gum. If the work affects the gloss when finished, rub the print over with a piece of wool slightly moistened with a solution of wax in benzole.

Colouring Prints with Artists' Water Colours.

The following are suitable colours for bromide enlargements, platinotypes, and carbon prints. The colours in ordinary type are permanent; those in italics are more or less doubtful except under special precautions against exposure. Those marked * are transparent.

*Alizarin Scarlet.
Flesh Tint, No. 1.
Flesh Tint, No. 2.
Flesh Tint, No. 3.
*Indian Red.
*Rose Madder.
Venetian Red.
Vermilion.
*Antwerp Blue.
Cobalt Blue.
*French Ultramarine.
Indigo.
*Prussian Blue.
**Brown Pink.*
*Burnt Sienna.
Cadmium Yellow.
Chrome Lemon.
Chrome Orange.
*Indian Yellow.
Naples Yellow.
*Raw Sienna.
Roman Ochre.
Yellow Ochre.
Emerald Green.
**Hooker's Green, No. 2*
Terre Verte.
**Brown Madder.*
Payne's Gray.
*Raw Umber.
*Sepia.
**Vandyke Brown.*
Ivory Black.
Lamp Black.
Chinese White.

Colours for Air-brush Work.

The following is a list of the most useful colours for air-brush work:—

Blanc d'Argent, No. 2.	Lamp Black.	Ultramarine, Light.
Burnt Sienna.	Light Red.	„ Middle.
Burnt Umber.	Mauve.	„ Deep.
Charcoal Grey.	Naples Yellow.	Vandyke Brown.
Chinese White.	Neutral Tint.	Vermilion.
Chrome Lemon.	Permanent Crimson.	Yellow Ochre.
Chrome Yellow.	Permanent Green.	Brown Madder.
Chrome Deep.	Permanent Scarlet.	Emerald Oxide of Chromium.
Chrome Orange.	Prussian Blue.	Indian Yellow.
Cologne Earth.	Raw Sienna.	Sepia.
Emerald Green.	Raw Umber.	
Indian Red.		

Spotting Bromide Prints.

Mix together Payne's grey and Indian ink (the colour should match that of the film).

Spotting P.O.P. Prints.

Add a little carmine to the above. When mixture is dry (on the palette) work in a strong solution of gum, rubbing the brush one way only, to avoid making air-bells. If the prints are to be enamelled or glazed by stripping after spotting, then artists' oil colours with benzole in which gum dammar has been dissolved, or water colours, may be used with shellac water varnish. (See "Negative Varnishes.")

Colouring from Behind (Crystoleum).

The print (which should be albumen) is mounted with a warm solution of:—

Hard gelatine	20 grs.	45 gms.
Water	1 oz.	1,000 c.c.s.

containing a little salicylic acid to keep it. Or with a cold mountant made by mixing the above with an equal volume of starch paste.

VARNISH FOR "TRANSLUCING."

Canada balsam	5 ozs.	100 gms.
Solid paraffin	2 ozs.	40 gms.
White wax	2 ozs.	40 gms.

which is melted, the picture immersed, and the whole kept as cool as possible consistent with remaining fluid.

MISCELLANEOUS FORMULÆ.

Reversed Negatives by Ammonium Persulphate.

A lantern or other thinly coated slow plate is placed in contact with the negative in a printing frame and a full exposure given such as would be thought advisable in making a soft positive transparency.

The plate is developed with a clean working developer (*e.g.*, glycin) until the shadows appear quite black on the glass side of the plate. The time of development may be five times as long as for an ordinary transparency. The latter is then washed and placed in a 2 per cent. solution of ammonium persulphate until the silver image is seen to be removed The plate is then thoroughly washed and developed in any clean developer containing about half a grain of bromide per ounce. It is then fixed and washed and dried. After the first development the operations may be done in weak daylight or artificial light. The action of the persulphate should be as complete as possible, otherwise a veil is left over the negative The above is a very rapid and economical process Direct positives, but reversed from right to left, from engravings, etc., may be made in the camera by substituting bromide paper for the plate. The exposure should be full and the development as above. The method has this advantage, that the lines are rendered in the same degrees of black and grey as in the original, a point of some importance, since the lines in an engraving are seldom, if ever, of uniform blackness.

To Recover Fogged Plates.

Potass. bichromate	..	100 to 200 grs.	11 to 22 gms.
Hydrochloric acid	..	30 minims	3 5 c.c.s.
Water	..	20 ozs.	1,000 c.c.s

Bathe plates in above for two minutes, wash for one or two minutes in running water, and dry. Solution slows plates, and may be used, as above or after exposure, to obtain contrast on extra-rapid plates—*e g*, when copying black and white or other subjects.

Backing Dry Plates.

Gum solution (ordinary office gum)	1 oz	100 c.c s.
Caramel	1 oz.	100 gms.
Burnt sienna, ground in water	2 ozs	200 gms.
Mix and add—		
Alcohol	2 ozs (fl)	200 c.c.s.

BACKING SHEETS FOR DRY PLATES.

Gelatine	1 part	50 gms.
Water	2 parts	100 c.c.s.
Glycerine	1 part	50 c c.s.
Indian ink	A small addition.	

Make a paste, and coat strong paper; place the prepared material face downwards on waxed glass to set. Press to back of plate before putting into dark slide.

The Dusting-on Process.

Best gum arabic	80 grs.	5 2 gms.
White sugar	60 grs.	4 0 gms.
Ammonium bichromate	60 grs.	4 0 gms.
Water	7 ozs.	200 c.c.s.
Methylated spirit	1 oz.	30 c.c.s.

ixture will keep for a few days only, and after the plate has ated and exposed it is developed with finest graphite powder, onised, and washed.

Ink for Rubber Stamps.

Aniline red (violet)	.. ..	900 grs.	210 gms.
Boiling distilled water	.. ..	10 oz.	1,000 c.c.s.
Glycerine	.. about	⅛ oz.	60 c.c.s.
Treacle	.. about	¼ oz.	30 c.c.s.

Invisible Ink.

Chloride of cobalt..	.. ..	25 grs.	60 gms.
Distilled water ..	.. ..	1 oz. (fl.)	1,000 c.c.s.

Writing executed with this ink is first pink on paper, becoming invisible on drying. On warming the writing turns blue.

Dead Black for Wood.

Borax	..	30 grs.	8 gms.
Glycerine	..	30 minims	8 c.c.s.
Shellac	..	60 grs.	16 gms.
Water	..	8 ozs.	1,000 c.c.s.

Boil till dissolved and add—

Nigrosine, W.S.	..	60 grs.	16 gms.

Or paint the wood first with –

Cupric chloride	..	75 grs.	75 gms.
Potassium bichromate ..	..	75 grs.	75 gms.
Water	..	2½ ozs.	1,000 c.c.s.

and as soon as the surface dries apply—

Aniline hydrochlorate ..	..	150 grs.	150 gms.
Water	..	2¼ ozs.	1,000 c.c.s.

and wipe off any yellow powder that forms. Repeat the process till black enough, and then rub over with boiled linseed oil.

Waterproofing Solution for Wood.

Asphalt	..	4 ozs.	400 gms.
Pure rubber	..	30 grs.	6 gms.
Mineral naphtha	..	10 ozs.	1,000 c.c.s.

Apply with a stiff brush and give three successive coats, allowing to dry between each. The vapour from this solution is very inflammable.

Polish for Cameras, Woodwork, etc.

Linseed oil..	..	20 ozs.	400 c.c.s.
Spirits of camphor ..	..	2 ozs.	40 c.c.s.
Vinegar	..	4 ozs.	80 c.c.s.
Butter of antimony ..	..	1 oz,	20 gms
Liquid ammonia	..	¼ oz.	5 c.c.s.
Water	..	¼ oz.	5 c.c.s.

This mixture is applied very sparingly with a bit of old flannel, and thoroughly rubbed off with soft rags.

Blackening Brass Work.

Copper nitrate	.. .. ..	200 grs.	450 gms.
Water	... .	1 oz.	1,000 c.c.s.

Place the brass work (perfectly cleaned) in the solution for a few moments, heating it on removal.

Varnish for Brass Work.

Celluloid	.. ..	10 grs.	4 gms.
Amyl alcohol	.. .. ..	½ oz.	100 c.c.s.
Acetone	.. ..	½ oz.	100 c.c.s.

Instead of this cold celluloid varnish, commercial "cold lacquer' can be used.

To Blacken Aluminium.

Clean the metal thoroughly with fine emery powder, wash well, and immerse in—

Ferrous sulphate	.. .. ..	1 oz.	80 gms.
White arsenic	.. .. ..	1 oz.	80 gms.
Hydrochloric acid	.. ..	12 ozs.	1,000 c.c.s.

Dissolve and add—

Water	.. ..	12 ozs.	1,000 c.c.s.

When the colour is deep enough dry off with fine sawdust, and lacquer.

Silvering Mirrors (Martin's Method).

(In employing the following formulæ, it should be well understood that the glass plate to be silvered must be scrupulously clean.)

A.—Nitrate of silver	.. .. ..	175 grs.	40 gms.
Distilled water	.. ..	10 ozs.	1,000 c.c.s.
B.—Nitrate of ammonium	.. ..	262 grs.	60 gms.
Distilled water	.. .. ..	10 ozs.	1,000 c.c.s.
C.—*Pure* caustic potash	.. ..	1 oz.	100 gms.
Distilled water	.. .. ..	10 ozs.	1,000 c.c.s.
D.—Pure sugar candy	.. ..	½ oz. (avoir.)	100 gms.
Distilled water	.. .. ..	5 ozs.	1,000 c.c.s.

Dissolve and add—

Tartaric acid	.. .. ..	50 grs.	23 gms.

Boil in flask for ten minutes, and when cool add—

Alcohol	.. ..	1 oz.	200 c.c.s.

Distilled water, *quant. suff.* to make up to 10 ozs. or 2,000 c.c.s

For use take equal parts of A and B. Mix together also equal parts of C and D, and mix in another measure. Then mix both these mixtures together in the silvering vessel, and suspend the mirror face downwards in the solution.

DEVELOPING FORMULÆ, ETC., OF THE PRINCIPAL PLATE AND PAPER MAKERS.

In all cases, except where otherwise specified, crystallised sodium sulphite and carbonate are to be used.

AUSTIN EDWARDS, LTD.

"Ensign" Flat and Roll-Films.

PYRO DEVELOPER.

A.—Pyro	1 oz.	12 5 gms.
Nitric acid	20 drops.	10 drops.
Or—		
Potass. metabisulphite .. .	100 grs	2·8 gms.
Water	80 ozs.	1,000 c.c.s.
B.—Soda carbonate (cryst.)	9 ozs.	112·5 gms.
Soda sulphite	10 ozs.	125 gms.
Potass. bromide	30 grs.	0·8 gms.
Water	80 ozs.	1,000 c.c.s.

For use, take A, 1 part; B, 1 part.

BAYER CO., LTD.

Bayer Bromide Paper.

A. Edinol (cryst.)	48 grs.	10 gms.
Soda sulphite (cryst.)	1 oz.	100 gms.
Potass. bromide	5 grs.	1 gm.
Water	10 ozs.	1,000 c.c.s.
B.—Potass. carbonate crystals ..	25 ozs.	250 gms.
Water	50 ozs.	500 c.c.s.

For use, take 4 ozs. A; 1 oz. B; and 5 ozs. water.

"Pan" Paper.

Sodium sulphite (cryst.)	..	1¼ oz.	125 gms.
Hydroquinone	..	72 grs.	16 gms.
Sodium carbonate (cryst.)	..	2½ ozs.	250 gms.
Potass. bromide	..	48 grs.	11 gms.
Water	..	10 ozs.	1,000 c.c.s.

"Tula" and "St. Luke's" Papers.

Potass. metabisulphite	..	48 grs.	1 gm.
Edinol crystals	..	24 grs	½ gm.
Potass. carbonate (cryst.)	..	144 grs.	3 gms.
Water	..	10 ozs.	100 c.c.s.
Potass. bromide, 10 % solution	..	6 drops	2 drops

The above developer, when freshly made, gives blue black tones; when standing for some time, brown-black tones.

BIRMINGHAM PHOTOGRAPHIC CO., LTD.

"Criterion" Plates.

Pyro Metol Developer.

A.—Pyro	.	60 grs.	3.9 gms.
Metol	.	40 grs.	2.6 gms.
Potass. metabisulphite	.	120 grs.	7.8 gms.
Potass. bromide	.	20 grs.	1·3 gms.
Water	.	20 ozs.	568 c.c.s.
B.—Soda carbonate (cryst.)	.	4 ozs.	125 gms.
Water	..	20 ozs.	568 c.c.s.

Any other standard developer (e.g. pyro soda, metol-hydroquinone) will give good results.

"Criterion" P.O.P.

Toning Baths.

Ammonium sulphocyanide	..	15 grs.	1·7 gm.
Gold chloride	..	1½ gr.	0·17 gm.
Water	..	20 oz.	1,000 c.c.s.

For Light Red Tones.

Ammonium sulphocyanide	..	10 grs.	1·1 gm.
Sodium sulphite	..	1 gr.	0·11 gm.
Gold chloride	..	1 gr.	0·11 gm.
Water	..	20 ozs.	1,000 c.c.s.

Estona (Self-Toning) Paper.

For good purple tones, place (without previous washing) for 5 to 10 minutes in hypo, 3 ozs.; water, 10 ozs.

For deeper tones use hypo, 5 ozs.; water, 10 ozs.

For red tones use hypo, 1½ ozs.; water, 10 ozs., fixing for 3 to 4 minutes.

Criterion "Non-Stress" Bromide Paper.

DEVELOPER.

Amidol ..	75 grs.	8·5 gms.
Sodium sulphite	650 grs.	74 gms.
Potass. bromide	4 grs.	0·4 gm.
Water ..	20 ozs.	1,000 c.c.s.

"Celerio" (Gaslight) Paper.

For Contrasty Effects.

Potass. metabisulphite	20 grs.	2·3 gms.
Metol	14 grs.	1·6 gm.
Hydroquinone	60 grs.	6·8 gms.
Sodium sulphite	1 oz.	50·5 gms.
Sodium carbonate	800 grs.	91 gms.
Potass. bromide, 10 % solution..	20 drops	30 drops
Water	20 ozs.	1,000 c.c.s.

For Soft Effects.

Metol	50 grs.	5·7 gms.
Sodium sulphite	200 grs.	23 gms.
Sodium carbonate	640 grs.	73 gms.
Potass. bromide, 10 % solution ..	20 minims	1·8 c.c.
Water	20 ozs.	1,000 c.c.s.

CADETT & NEALL, LTD.

"Royal Standard" Plates.

Rapid," "Extra Rapid," "Special Extra Rapid," and 'Ortho.'

PYRO-SODA.

A.—Pyro..	..	1 oz.	12·5 gms.
Sodium sulphite	..	8 ozs.	100 gms.
Potass. metabisulphite ..	..	50 grs.	1·5 gm.
Potass. bromide	..	35 grs.	1 gm.
Water (distilled or boiled)	to	80 ozs.	1,000 c.c.s.
B.—Sodium carbonate.. ..	..	2 oz.	100 gms.
Water (distilled or boiled)	to	20 ozs.	1,000 c.c.s.

For studio work use, A, 1 part; B, 1 part; water, 2 parts.

For outdoor work use, A and B equal quantities.

For under-exposure use more of B.

For over-exposure use more of A with addition of few drops of 10% solution of potass. bromide.

For the Royal Standard Ortho plates the above developer is used, but with bromide in solution A, as follows:—

Potass. bromide	54 grs.	1·5 gm.

"Royal Standard" P.O.P.

Toning Bath for Cold Tones.

A.—Gold chloride	15 grs.	1 gm.
Water	15 drs.	54 c.c.s.
B.—Ammonium sulphocyanide ..	1 oz.	45·5 gms.
Water	22 ozs.	1,000 c.c.s.

Water, 20 ozs.; B, 1 oz.; A (added gradually), 2 drachms.

For Warm Tones.

A.—Gold chloride	15 grs.	1 gm.
Water	15 ozs.	425 c.c.s.
B.—Borax	300 grs.	23 gms.
Water	30 ozs.	1,000 c.c.s.

A, 1 oz.; B, 2 ozs.; water to 40 ozs.

"Cadett" Bromide Papers.

METOL-HYDROQUINONE.

For very Brilliant Prints.

A.—Metol	100 grs.	6 gms.
Hydroquinone	50 grs.	3 gms.
Sodium sulphite	2 ozs. avd.	20 gms.
Water to make	40 ozs. (fl.)	1,000 c.c.s.
B.—Sodium carb. (cryst.) *washing* soda, select translucent pieces	1 oz. avd.	25 gms.
Potass. bromide	60 grs.	3 gms.
Water to make	40 ozs. (fl.)	1,000 c.c.s.

Equal parts of A and B to make developer.

"Royal Standard" Lantern Plates.

Black Tone.

METOL DEVELOPER.

A.—Metol	200 grs.	15 gms.
Sodium sulphite (cryst.) ..	2 ozs.	60 gms.
Potassium bromide	25 grs.	2 gms.
Water	20 ozs.	600 c.c.s.
B.—Washing soda	5 ozs.	150 gms.
Water	20 ozs.	600 c.c.s.

This developer works rather slowly, about 2½ to 3 minutes giving brilliant slides.

"CHALLENGE" WORKS.

"Challenge" P.O.P.

Toning Solution.

Ammonium sulphocyanide ..	20 grs.	2·3 gms.
Gold chloride	2 grs.	0·23 gm.
Water	20 ozs.	1,000 c.c.s.

Toning is complete in five to ten minutes.

Self-Toning "Challenge" P.O.P.

For red to brown tones, print rather darker than for P.O.P., and fix in hypo 3 ozs., water 20 ozs. for ten minutes.

For brown to purple tones, print until shadows become blocked, and fix in hypo 6 ozs., water 20 ozs. for six minutes.

"Challenge" Bromide Papers.

Developer.

Amidol	50 grs.	5·7 gms.
Sodium sulphite	650 grs.	74 gms.
Potass. bromide	10 grs.	1·14 gm.
Water	20 ozs.	1,000 c.c.s.

To be used within three days of making.

"Challenge" Gaslight Paper.

Developer.

Metol	8 grs.	1·8 gm.
Sodium sulphite	½ oz.	50 gms.
Hydroquinone	30 grs.	6·8 gms.
Sodium carbonate (cryst.) ..	1 oz.	100 gms.
Potass. bromide, 10 per cent. solution	30 drops	100 drops
Water	10 ozs.	1,000 c.c.s.

The above is for contrasty prints.

ELLIOTT AND SONS, LTD.

Barnet Plates.

Barnet," "Red Seal," "Ortho," and "Medium Ortho" Plates.

Pyro Stock Solution A.

Potass. metabisulphite	100 grs.	6·5 gms.
Pyro	1 oz.	28 gms.
Potass. bromide	60 grs.	3·9 gms.
Water	8 ozs.	225 c.c.s.

Developer.

No. 1.—Solution A.	2 ozs.	50 c.c.s.
Water	18 ozs.	450 c.c.s.
No. 2.—Sodium carbonate	2 ozs.	100 gms.
Sodium sulphite	2¼ ozs.	112·5 gms.
Water	20 ozs.	1,000 c.c.s.

For use, take equal parts of Nos. 1 and 2. For soft negatives or portraiture, take No. 1, 1 part; No. 2, 2 parts; water, 1 part.

For "Studio" Plates.

A.—Pyro	1 oz.	12 gms.
Potass. bromide	60 grs.	2 gms.
Soda metabisulphite	100 grs.	2 8 gms.
Water	80 ozs.	1,000 c.c.s.
B.—Sodium sulphite	9 ozs.	112 gms.
Sodium carbonate	8 ozs.	100 gms.
Water	80 ozs.	1,000 c.c.s.

For ordinary use, equal parts of Nos. 1 and 2.

For Barnet roll-film the "Studio" developer is used, except that in place of the metabisulphite nitric acid 20 drops (metric, ½ c.c.) is used.

Barnet P.O.P.

For Barnet "Ordinary" P.O.P., the A sulphocyanide solution given below is mixed with gold—16 ozs., with 2 grs. gold or 350 c.c.s., with 0·1 gm. to form the toning bath.

Toning Baths for Matt. P.O.P.

A.—Ammonium sulphocyanide ..	80 grs.	2·3 gms.
Water	80 ozs.	1,000 c.c.s.
B.—Gold chloride	15 grs.	1 gm.
Water	15 drs.	60 c.c.s.
C.—(To be made up fresh every day)		
Sulphite soda	15 grs.	1 gm.
Water	15 drs.	60 c.c.s.

For use, take 16 ozs. A, 2 drachms B, and 2 drachms C.

A good rich brown tone takes about 3 minutes, but for colder tones toning should be carried further. Judge the tone by looking on the surface of the prints.

Another good bath is—

Sodium phosphate	60 grs.	3·4 gms.
Gold chloride	2 grs.	0·11 gm.
Water	40 ozs.	1,000 c.c.s.

Keep this bath for an hour before use, and throw it away as soon as the prints are toned, as it will not keep long.

Barnet "Kiplo" (Self-Toning) Paper.

Place direct for 8 to 15 minutes in hypo, 1 oz.; water, 5 ozs.; or use a 1 : 20 salt bath for five minutes previous to above.

Barnet Bromide Papers.

Metol Developer.

A.—Metol	400 grs.	11 gms.
Sodium sulphite	8 ozs.	100 gms.
Potass. bromide	50 grs.	1·5 gm.
Water	80 ozs.	1,000 c.c.s.
B.—Potass. carbonate..	8 ozs.	100 gms.
Water	80 ozs.	1,000 c.c.s.

Take 3 ozs. of A and 1 oz. of B.

The image should appear in a few seconds, and development will be complete in about 1½ minutes. Rinse in three changes of water and fix.

Metol-Hydroquinone.

Metol	200 grs.	6 gms.
Sodium sulphite	6 ozs.	75 gms.
Hydroquinone	150 grs.	4 gms.
Potass. carbonate	2 ozs.	25 gms.
Potass. bromide	50 grs.	1·5 gm.
Water	80 ozs.	1,000 c.c.s.

Development will be complete in from 1 to 2 minutes.

For softer prints, either of the above may be diluted with an equa bulk of water just before use.

Barnet "Oyster-Shell" (Gaslight) Paper.

Metol .. .	8 grs.	1·75 gms.
Hydroquinone ..	30 grs.	7 gms.
Sodium sulphite .	350 grs.	75 gms.
Sodium carbonate	300 grs.	70 gms.
Potass. bromide ..	3 grs.	0·7 gm.
Water	10 ozs.	1,000 c.c.s

The ingredients should be dissolved in the order named.

For soft prints of cold black tone, use:—Rodinal, 1 part; water, 30 parts.

Barnet Lantern Plates.

For Warm Black Tones.

A.—Hydroquinone	160 grs.	18 gms.
Sodium sulphite	2 ozs.	100 gms.
Potass. bromide	30 grs.	3 gms.
Citric acid	60 grs.	7 gms.
Water	20 ozs.	1,000 c.c.s.
B.—Sodium hydrate	160 grs.	18 gms.
Water	20 ozs.	1,000 c.c.s.

Take equal parts of A and B.

This produces a very pleasing warm black. Length of time in developing, about 2 minutes.

For Warm Brown Tones.

A.—Pyro	¼ oz.	12·5 gms.
Soda sulphite	1 oz.	50 gms.
Water	20 ozs.	1,000 c.c.s.
B.—Carbonate of ammonia	225 grs.	26 gms.
Potassium hydrate	190 grs.	21 gms.
Ammonium bromide	150 grs.	17 gms.
Water	20 ozs.	1,000 c.c.s.

Take equal parts of A and B. Length of time in developing, about minutes.

Or the following may be used :—

Take equal parts of hydroquinone formula and add to each ounce (100 c.c.s.) 3 grs. (0·6 gm.) each of carbonate of ammonia and ammonium bromide. Length of time in developing, about 3 or 4 minutes.

For Very Warm (Reddish) Tones.

Take equal parts of hydroquinone formula and add to each ounce (100 c.c.s.) 6 grs. (1·2 gm.) each of carbonate of ammonia and ammonium bromide. Length of time in developing about 8 minutes.

Barnet "Cold-Tone" Lantern Plate.

DEVELOPER.

A.—Hydroquinone	150 grs.	17·1 gms.
Potass. metabisulphite	10 grs.	1·1 gm.
Potass. bromide	50 grs.	5·7 gms.
Water to make	20 ozs.	1,000 c.c.s.
B.—Soda sulphite	2 ozs.	100 gms.
Caustic soda	100 grs.	11·4 gm.
Water to make	20 ozs.	1,000 c.c.s.

Use equal parts of A and B.

Barnet (Gaslight) Lantern Plates.

For Black and Warm Black Tones.

Hydroquinone	60 grs.	6·8 gms.
Sodium sulphite	1 oz.	50 gms.
Potass. carbonate..	2 ozs.	100 gms.
Potass. bromide	20 grs.	2·3 gms.
Water	20 ozs.	1,000 c.c.s.

This solution should develop in about two minutes.

For Cold Black Tones.

Rodinal	1¼ ozs. (fl.)	62·5 c.c.s.
Potass. bromide	15 grs.	1·7 gm.
Water	20 ozs.	1,000 c.c.s.

For Warm Tones.

Eikonogen..	30 grs.	3·4 gms.
Hydroquinone	10 grs.	1·2 gms.
Sodium sulphite ..	160 grs.	18·2 gms.
Potass. carbonate..	80 grs.	9·1 gms.
Potass. bromide ..	15 grs.	1·7 gms.
Citric acid	20 grs.	2·3 gms.
Water	20 ozs.	1,000 c.c.s

GEM DRY PLATE COMPANY, LTD.

"Gem" Plates.

Pyro-Soda, special for Studio Use.

A.—Pyro.		1 oz.	10 gms.
	Potass. metabisulphite	½ oz.	5 gms.
	Potass. bromide ..	20 grs.	0·4 gm.
	Water to	100 ozs.	1,000 c.c.s.
B.—Sodium carbonate		8 ozs.	80 gms.
	Sodium sulphite	16 ozs.	160 gms.
	Water to	100 ozs.	1,000 c.c.s.

To develop mix equal parts of A and B.

Metol-Hydroquinone.

Potass. metabisulphite	40 grs.	4 gms.
Metol	28 grs.	0·8 gm.
Hydroquinone	120 grs.	12 gms.
Sodium sulphite	2 ozs.	96 gms.
Sodium carbonate	3½ ozs.	168 gms.
Water	40 ozs.	1,800 c.c.s.

Add and dissolve in order named. To each ounce (28 c.c.s.) of developer add 2 drops of a 10 per cent. solution of potass. bromide. Dilute with an equal volume of water.

"Gem" P.O.P.

A.—Ammonium sulphocyanide		30 grs.	2 gms.
	Water	10 ozs.	284 c.c.s.
B.—Gold chloride		2 grs.	0.13 gm.
	Water	10 ozs.	284 c.c.s.

Into a portion of A pour slowly an equal portion of B.

Combined Bath.

Sodium hyposulphite ..	5 ozs.	140 gms.
Citric acid	12 grs.	0·8 gm.
Lead acetate	12 grs.	0·8 gm.
Alum	120 grs.	8 gms.
Hot water	16 ozs.	500 c.c.s.

Stand twenty-four hours, filter and add—

Gold chloride	5 grs.	0·3 gm.
Dissolved in water	1 oz.	30 c.c.s.

"Gem" Bromide and Gaslight Papers.

The metol-hydroquinone developer given above for plates is recommended, as it stands, also for "Gem" gaslight paper; for "Gem" bromide papers it is diluted with an equal quantity of water.

"Gem" Lantern Plates.

Developer for Cold Tones.

A.—Hydroquinone	.. .. ..	120 grs.	8 gms.
Potass. bromide	.. .. ..	180 grs.	12 gms.
Potass. metabisulphite	.. ..	120 grs.	8 gms.
Water	.. ..	30 ozs.	900 c.c.s.
B.—Caustic potash (sticks)	.. ..	240 grs.	16 gms.
Water	.. ..	30 ozs.	900 c.c.s.

Use equal parts of A and B.

For chloride plates, dilute with water 4 to 8 times.

For Warm Tones.

C.—Ammonium carbonate	.. ..	1 oz.	10 gms.
Ammonium bromide	.. ..	1 oz.	10 gms.
Water	.. ..	20 ozs.	200 c.c.s.

To obtain extra warm tones on "Gem" red lantern plates, give over-exposure and develop with one part of solution A and B and one part of C, increasing C as the exposure is lengthened.

GEVAERT, LIMITED.

Gevaert P.O.P.

Toning Baths.

Ammonium sulphocyanide	..	35 grs.	4 gms.
Water, distilled..	.. ..	20 ozs.	1,000 c.c.s.

Two hours before use, addition is made of :—

Gold chloride solution (15 grs. in 2 ozs.)	.. ..	2 to 2½ drs.	13 c.c.s.

This formula yields fine purple blue tone.

For carmine red tones, printing is done only slightly deeper than the finished print is required to be. The prints are given three five-minute soaks in water and toned in :—

Ammonium sulphocyanide	..	45 grs.	5 gms.
Potass. iodide	.. .. ..	10 grs.	1 gm.
Gold chloride solution (15 grs. in 2 ozs.)..	.. .. ..	2½ drs.	15 c.c.s.
Water	.. ..	20 ozs.	1,000 c.c.s.

Toning must be continued until the deepest shadows, on holding the prints up to the light and looking through them, show the carmine tone; this will take about half an hour. Until the toning has begun the prints should be kept constantly on the move, but they can then be left to themselves, except for the movement they get as each is picked out for examination at intervals. The toning bath should be used only once, and it should be noted that the prints gain a little in drying. Wash in one or two changes of water, and fix in the usual hypo. bath of 2 ozs. to 20 ozs. of water.

Gevaert Collodion Paper.

Gold Toning Solution.

Sodium acetate, cryst.	90 grs.	10 gms.
Borax, powdered	90 grs.	10 gms.
Water	20 ozs.	1,000 c.c.s.

This solution (without gold) keeps indefinitely, and can be made up in quantity. The toning solution is made up as follows: —

Stock solution	18 ozs.	400 c.c.s.
Gold chloride solution (15 grs. in 2 ozs.)	1 to 1¼ drs.	3 to 3·5 c.c.s.

This is mixed a quarter of an hour before use, and the quantity given (18 ozs.) will tone about two dozen cabinets.

Platinum Toning Bath.

Potass. chloroplatinite	15 grs.	1 gm.
Phosphoric acid sp. gr. 1·120 ..	2½ to 3 drs.	10 c.c.s.
Water, distilled	42 ozs.	1,200 c.c.s.

This bath should be filtered each time before use.

Fixing Bath.

Hypo... 1 oz. 50 gms. Water.. 20 ozs. 1,000 c.c.s.

Prints should be fixed for at least ten minutes.

Sepia to Dark Brown Tones.

(1) *With salt and platinum baths only, no gold bath.*

Printing is done rather more deeply than the finished print should appear. Prints are washed in two or three changes of water (about fiv minutes in each), and then transferred to a weak salt solution (a pinch of salt in 40 ozs. of water). Here they are left until they are seen to be brick-red. They are then given another couple of washes in water (each of five minutes) and transferred to the platinum bath given above.

This bath is diluted with an equal or double volume of distilled water and the prints allowed to remain in it until they have reached the desired sepia or dark brown tone.

(2) *With ammonia and platinum solutions only, no gold bath. A very easy and certain process.*

Prints intended for a sepia tone by this method must be made lighter than for black tones. They are given a first washing in three changes of water as quickly as possible, and then placed in a bath of weak ammonia.

Ammonia	1 dr.	5 c.c.s.
Water	20 ozs.	1,000 c.c.s.

In which they turn lemon yellow and appear much too light. They are given a thorough washing in six changes of water and then transferred to the platinum bath already given for black tones, but diluted with two or three times its bulk of water. They are allowed to remain until the desired tone is reached, and then washed, fixed, and finally washed as usual.

Gevaert Bromide Paper.

METOL-HYDROQUINONE DEVELOPER.

Metol	40 grs.	6 gms.
Hydroquinone	15 grs.	2 gms.
Soda sulphite, cryst.	1 oz.	60 gms.
Potash carbonate..	140 grs.	20 gms.
Potass. bromide	70 grs.	10 gms.
Water to	20 ozs.	1,200 c.c.s.

Dissolve the metol first in the water, and then add the other chemicals in the order given. This developer will keep good for a long time if kept well corked.

Gevaert Gaslight Paper.

METOL-HYDROQUINONE DEVELOPER.

Metol	12 grs.	1·5 gm.
Soda sulphite	1¼ ozs.	75 gms.
Hydroquinone	50 grs.	6 gms.
Soda carbonate (cryst.)	¾ oz.	40 gms.
Potass. bromide (10 per cent. solution)..	30-60 drops	50-100 drops
Water	20 ozs.	1,000 c.c.s.

The above constituents should be dissolved in the order named. The solution keeps for a long while in well-stoppered bottles.

GLYCIN DEVELOPER.

For Warm Tones.

The time of exposure may be prolonged or curtailed in order to obtain a range of colours, and the same developing formula used for all.

Glycin developer stock mixture :—

Soda sulphite	2½ ozs.	62 gms.
Glycin	1 oz.	25 gms.
Potass. carbonate..	5 ozs.	125 gms.
Water, distilled, and hot ..	4 ozs.	100 c.c.s.

Dissolve the chemicals in the above order, adding the potass. carbonate last, and in small quantities as the mixture froths up. A 20-oz. measure should be used for the above quantities. The result is a mixture of creamy appearance and consistency which must be vigorously shaken before use.

Developer.

Stock solution	½ oz.	10 c.c.s.
Water ..	15 ozs.	300 c.c.s.
Potass. bromide (10 per cent. solution)	7 drops	5 drops

Gevaert Gravure Paper.

For photogravure effects. Print only slightly beyond the depth required, wash for half an hour in four or six changes, and for warm black tones, tone in :—

Potass. chloroplatinite	15 grs.	1 gm.
Phosphoric acid, sp. gr. 1·120 ..	5 drs.	10 c.c.s.
Water, distilled	40 ozs.	1,200 c.c.s.

Wash in five or six changes and fix in 1 : 10 hypo for fifteen to twenty minutes.

For cold or bluish-black tones, tone first in :—

Borax	90 grs.	10 gms.
Sodium acetate	90 grs.	10 gms.
Gold chloride solution (15 grs. in 2 ozs.)	1½ to 2 drs.	8 to 11 c.c.s.
Water	20 ozs.	1,000 c.c.s.

This is made up just before use. Tone for ½ to two minutes, rinse, pass through the platinum bath, wash in five or six changes, and fix and wash as usual.

Art Platinum Paper.

DEVELOPER FOR "BLACK" PAPER.

Potass. oxalate, neutral ..	10½ ozs.	300 gms.
Water	35 ozs.	1,000 c.c.s.

Use luke warm.

For prints from weak negatives add 3 to 4 drs. (10 to 15 c.c.s. of 2 per cent. potass. bichromate solution.

DEVELOPER FOR "WARM-BLACK" PAPER.

Potass. oxalate, neutral	6 ozs.	300 gms.
Mercury bichloride solution, 5 per cent.	½ oz.	25 c.c.s.
Citric acid (cryst.)	130 grs.	15 gms.
Water	20 ozs.	1,000 c.c.s.

Used at 120 deg. Fahr., and with bichromate when necessary.

DEVELOPER FOR "SEPIA" PAPER.

Potass. oxalate, neutral	2 ozs.	100 gms.
Potass. phosphate (K_3PO_4) ..	1 oz.	50 gms.
Citric acid (cryst.)..	180 grs.	20 gms.
Potass. chlorate	90 grs.	10 gms.
Water	20 ozs.	1,000 c.c.s.

Dissolve chemicals with water almost boiling and use at 160 deg. Fahr.

For the black papers, use a clearing bath of :—

Hydrochloric acid .. .. $\begin{cases} 4\frac{1}{2} \text{ drs.} \\ 8 \text{ c.c.s.} \end{cases}$ water $\begin{cases} 70 \text{ ozs.} \\ 1{,}000 \text{ c.c.s.} \end{cases}$

For the sepia papers use a bath of :—

Hydrochloric acid .. 30 to 40 minims water, 70 ozs.

Allowing prints 10 minutes in each of these.

JOHN J. GRIFFIN & SONS, LTD.

Griffin P.O.P.

"SPECIAL P.O P."

Separate Toning and Fixing.

Wash prints for 10 minutes, then place in—

Gold chloride	1½ gr.	0 17 gm
Ammonium sulphocyanide ..	15 grs.	1·7 gm.
Water	20 ozs.	1,000 c.c.s.

"PROFESSIONAL" P.O P

Toning Bath.

Gold chloride	1½ gr	0 1 gm.
Ammonium sulphocyanide ..	15 grs.	1 gm.
Water	25 oz .	700 c c s.

Goldona (Self-Toning) Paper.

The prints are plunged straight into the fixing bath.
For warm tones, fix in 1 . 5 hypo for 10 to 15 minutes
For colder tones, fix in 2 5 hypo for 15 to 25 minutes.

"Snow-White" Bromide Paper.

To develop the image, first plunge the paper in clean water, place at the bottom of a clean porcelain dish, and apply evenly the following or any standard developer —

Amidol	70 grs.	8 gms.
Sodium sulphite	650 grs.	75 gms.
Potassium bromide .. .	4 grs.	0 45 gm.
Water	20 ozs.	1,000 c.c.s.

"Noctona" (Gaslight) Paper.

Developer.

Water	20 ozs	1,000 c c s
Metol	15 grs.	1 7 gms
Hydroquinone	60 grs.	6 8 gms.
Soda sulphite	440 grs.	50 gms
Soda carbonate	600 grs.	68 gms.
Potass. bromide	7 grs	0 8 gm

Dissolve in the order given. Normal time of development about 30 seconds.

"Gaslyt" Lantern Plates.

Developer for Black Tones.

Water	8 ozs.	1,000 c.c.s.
Metol	4 grs.	1·2 gm.
Sodium sulphite	75 grs.	20 gms.
Hydroquinone	16 grs.	4·6 gms.
Sodium carbonate	280 grs.	80 gms.
Potassium bromide	8 grs.	2·3 gms.

For Warm or Sepia Tones.

Solution (as for black tones)	1 oz.
Water	2 ozs.
Potassium bromide solution (10 per cent.) ..	10 drops

Rawlins's Oil-Pigment Paper.

Sensitiser.

Potass. bichromate ..	80 grs.	18·2 gms.
Potass. citrate	1 oz.	100 gms.
Citric acid	40 grs.	9·1 gms.
Water	10 ozs.	1,000 c.c.s.

The potassium citrate and the citric acid should be dissolved together in part of the water and added to the potassium bichromate which has been previously dissolved in the remainder of the water. The mixed solution will keep provided "used" solution is not returned to the bottle. Immerse paper for not less than two minutes.

HALIFAX PHOTOGRAPHIC CO.

"Halifax" Plates.

SWIFLEX.

A.—Pyro	½ oz.	16 gms.
Potass. metabisulphite	½ oz.	16 gms.
Potass. bromide	10 grs.	0·76 gm.
Water	30 ozs.	1,000 c.c.s.
B.—Sodium carbonate	3 ozs.	100 gms.
Sodium sulphite	4 ozs.	133 gms.
Water	30 ozs.	1,000 c.c.s.

Use equal parts of A and B, or increase B for soft effect.

TRADE.

A.—Pyro	¼ oz.	12·5 gms.
Potass. metabisulphite	30 grs.	3·4 gms.
Water	20 ozs.	1,000 c.c.s.

B.—Soda carbonate (cryst.)	...	2 ozs.	100 gms.
Soda sulphite (cryst.)	... ...	2 ozs.	100 gms.
Potass. bromide	... ...	10 grs.	1·14 gms.
Water	... ...	20 ozs.	1,000 c.c.s.

Use equal parts of A and B.

PROCEX.

A.—Pyro	... ...	1 oz.	20 gms.
Potass. metabisulphite	... ...	½ oz.	10 gms.
Potass. bromide	... ...	20 grs.	0·91 gm.
Water to make	... ...	50 ozs.	1,000 c.c.s.
B.—Sodium carbonate	... ...	6 ozs.	120 gms.
Sodium sulphite	... ...	8 ozs.	160 gms.
Water to make	... ...	50 ozs.	1,000 c.c.s.

Use equal parts of A and B.

"Lilywhite" P.O.P.

Combined Bath.

Water (pure or distilled) hot	...	20 ozs.	1,000 c.c.s.
Hypo	... ...	5 ozs.	250 gms.
Ammonium sulphocyanide	...	240 grs.	27·4 gms.
Citric acid	... ...	60 grs.	6·84 gms.
Lead acetate	... ...	60 grs.	6·84 gms.
Alum	... ...	60 grs.	6·84 gms.
Gold chloride (in solution)	...	3 grs.	0·34 gm.

Dissolve in the order named and use when cold. Use 1 grain of gold for 8 to 10 cabinets.

The separate toning baths (sulphocyanide, borax, and acetate) are also recommended for "Lilywhite" P.O.P.

"Lilywhite" C.C. Paper.

GOLD-PLATINUM TONING.

The well-washed parts are first toned in :—

Sodium acetate	.. .. ..	62 grs.	4 gms.
Borax	.. ..	62 grs.	4 gms.
Gold chloride, 1 per cent. solution		2½ drs.	9 c.c.s.
Water	. .. .	14 ozs.	400 c.c.s.

After an intermediate wash of about 3 minutes, tone in—

Potass. chloroplatinite	..	15 grs.	1 gm.
Phosphoric acid (sp. gr. 1·12)		2½ drs.	9 c.c.s.
Water	.. ..	40 ozs.	1,140 c.c.s.

"Lilywhite" Self-Toning P.O.P.

Fixing bath for brown to purple tones—

Hypo	... ...	4 ozs.	200 gms.
Water	... ...	20 ozs.	1,000 c.c.s.

For warmer tones this is used half-strength.

For colder tones five minutes' immersion in 10 per cent. salt bath is given prior to fixing.

"Lilywhite" Bromide Paper.

Metol ..	50 grs.	5·7 gms.
Hydroquinone	15 grs.	1·7 gm
Soda sulphite	500 grs.	57 gms.
Potass. bromide	10 grs.	1·1 gm.
Potass. carbonate	100 grs.	11·4 gms.
Water ..	20 ozs.	1,000 c.c.s.

"Lilywhite" Gaslight Paper.

Developer.

Water (boiled or distilled) cold	20 ozs.	1,000 c.c.s.
Metol	15 grs.	1·71 gm.
Sodium sulphite (cryst.) ...	540 grs.	61·6 gms.
Hydroquinone	60 grs.	6·84 gms.
Sodium carbonate... ...	1,080 grs.	123·1 gms.
Potass. bromide	3 grs.	0·34 gm.

Dissolve in order named and keep well corked. A few drops of 10 per cent. solution potass. bromide should be added if increased contrast is desired. If softer results are wanted, increase the exposure and dilute the developer with equal bulk of water.

ILFORD, LTD.

Ilford Plates.

(*"Ordinary," "Zenith," "Monarch," "Chromatic," "Versatile," etc.*)

PYRO-SODA DEVELOPER.

Stock Solutions.

A.—Water	5½ ozs.	150 c.c.s.
Nitric acid	20 drops	20 drops
Pyrogallic acid	1 oz.	28 gms.

This solution will keep good for several weeks.

Or—

B.—Water	5½ ozs.	150 c.c.s.
Potass. metabisulphite	70 grs.	5 gms.
Pyrogallic acid	1 oz.	28 gms.

This solution will keep good for several months.

Working Solutions.

No. 1.—Stock solution of pyro, A or B	1 to 2 ozs.	25 to 50 c.c.s
Water to make up to	20 ozs.	500 c.c.s.
No. 2.—Sodium carbonate, crystals (not bicarbonate) avoirdupois) ..	2 ozs.	100 gms.
Sodium sulphite (avoirdupois) ..	2 ozs.	100 gms.
Potassium bromide	20 grs.	2 gms.
Water to make up to	20 ozs.	1,000 c.c.s

For normal exposure take equal quantities of Nos. 1 and 2.

METOL-HYDROQUINONE.

A.—Metol	.. ..	60 grs.	3·5 gms.
Hydroquinone	.. .. ..	90 grs.	5 gms.
Potass. metabisulphite	.. ..	90 grs.	5 gms.
Water up to	.. .. ..	20 ozs.	500 c.c.s.

B.—The No. 2 given for pyro-soda above.

METOL-PYRO DEVELOPER.

This developer is fully as energetic as metol-hydroquinone. In dealing with unknown exposures it is best to start with equal parts of A and C, and add B and more of C if necessary afterwards.

A.—Stock solution of pyro	.. ..	2 ozs.	50 c.c.s.
Water up to	.. .. ..	20 ozs.	500 c.c.s.
B.—Metol	.. ..	90 grs.	5 gms.
Potass. metabisulphite	.. ..	20 grs.	1 gm.
Potass. bromide	.. .. ..	45 grs.	2·5 gms.
Water up to	.. .. ..	20 ozs.	500 c.c.s.

C.—The No. 2 given for pyro-soda above.

Normal Developer.—A, 1 part; B, 1 part; C, 2 parts.

Ilford "Process" Plates.

Development of Line Negatives.

A.—Metol	.. ..	30 grs.	2·3 gms.
Hydroquinone	.. .. ..	150 grs.	11·4 gms.
Sodium sulphite	.. .. ..	3½ ozs.	108 gms.
Water	.. ..	30 ozs.	1,000 c.c.s.
B.—Potass. carbonate	.. ..	6 ozs.	200 gms.
Potass. bromide	.. .. ..	90 grs.	6·8 gms.
Water	.. ..	30 ozs.	1,000 c.c.s.

Use equal parts of A and B, develop for about one minute, then immerse in a weak solution of sodium citrate (or add a little to the developer), and complete development. Great density is thus obtained.

The negatives should be fixed in an acid-alum-hypo bath, and can then be dried quickly in moderate warmth.

Development of Screen Negatives.

A.—Metol	.. ..	40 grs.	4·6 gms.
Hydroquinone	.. .. ..	50 grs.	5·7 gms.
Potass. bromide	.. .. ..	30 grs.	3·4 gms.
Soda sulphite	.. .. ..	80 grs.	9·1 gms.
Water	.. ..	20 ozs.	1,000 c.c.s.
B.—Caustic potash	.. .. ..	100 grs.	11·4 gms.
Water	.. ..	20 ozs.	1,000 c.c.s.

Use equal quantities of A and B, fix in hypo (8 ozs. to the pint), "cut" with Farmer's reducer, clear with

Sulphuric acid	.. .. ..	2 drs.	25 c.c.s.
Water	.. ..	10 ozs.	1,000 c.c.s.

and intensify by Monckhoven method.

Dye Bath for Three-Colour Work.

Stock Solution A.

Pinaverdol	1 gm.
Warm absolute alcohol	1,000 c.c.s.

The bathing solution is composed of :—

Solution A	4 parts
Ammonia, 0·880 pure	2 parts
Distilled water	200 parts

in which plates are immersed for three minutes.

Ilford P.O.P.

Hardening Bath.

Alum	1½ oz.	45 gms.
Common salt	1 oz.	30 gms.
Water	20 ozs.	600 c.c.s.

in which prints are kept moving for 5 or 10 minutes.

Toning Bath.

No. 1.—Ammonium sulphocyanide ..	100 grs.	6·5 gms.
Water	10 ozs.	300 c.c.s.
No. 2.—Sodium sulphite	10 grs.	0·65 gm.
Water	10 ozs.	300 c.c.s.

This solution must be made up only on the day of using; any left must be thrown away.

No. 3.—Gold chloride	15 grs.	1 gm.
Water	15 ozs.	450 c.c.s.

For the usual toning bath, take 2 ozs. each of Nos. 1 and 3, and make up to 20 ozs. with water.

For *warm* tones and Special P.O.P. add 1½ to 2 ozs. of No. 2 to the above bath just before toning, and withdraw prints according to tone desired.

Ilford Self-Toning Papers.

KALONA.

The prints, without previous washing, are slipped rapidly one by one face upwards into the following solution :—

Alum (powdered)	1½ ozs.	30 gms.
Ammonium sulphocyanide ..	20 grs.	1 gm.
Water	20 ozs.	400 c.c.s.

where they must be constantly turned over for five minutes. The prints should next be washed for ten minutes in running water or repeated changes, and fixed for ten minutes in a solution of—

Hypo	3 ozs.	75 gms.
Water	20 ozs.	500 c.c.s.

They are then finally washed for two hours in the same way as Ilford P.O.P.

HYPTONA.

Wash for five minutes, and fix for five to fifteen minutes in :—

Hypo	2 ozs.	50 gms.
Water	20 ozs.	500 c.c.s.

Finally wash for half-an-hour,

A stronger hypo solution or longer fixation gives colder tones, a weaker solution or shorter fixation warmer tones.

If a still colder tone is desired place the prints *without previous washing* in a bath of common salt 1 oz. (25 gms.), water 10 ozs. (250 c.c.s.) for five minutes, and then fix as above. The stronger the salt bath the colder the tone.

INTONA.

Print by daylight to a distinctly greater depth than required in the finished print.

Fix by placing the prints direct, without previous washing, in—

Hypo	4 ozs.	100 gms.
Water	20 ozs.	500 c.c.s.

for from five to ten minutes, keeping them in constant motion. Not less than five minutes should be allowed for fixation.

A fresh fixing bath must be used for each batch of prints. Allow about 1 oz. (30 c.c.s.) of the hypo solution for each half-plate print and so on in proportion.

Wash for about an hour in running water or frequent changes keeping the prints well separated.

Ilford Bromide Paper and Opals.

Metol-Hydroquinone Developer.

No. 1.—Metol	50 grs.	4 gms.
Hydroquinone	25 grs.	2 gms.
Sodium sulphite	1 oz.	35 gms.
Water up to	20 ozs.	700 c.c.s.
No. 2.—Sodium carbonate (crystals) ..	1 oz.	35 gms.
Potass. bromide	30 grs.	2·4 gms.
Water up to	20 ozs.	700 c.c.s.

Take equal quantities of No. 1 and No. 2.

Certinal Developer.

Certinal	16 minims	1 part
Water	1 oz.	30 parts

Ilford Gaslight Papers.

Developer.

Metol	5 grs.	0 3 gm.
Sodium sulphite	½ oz.	15 gms.
Hydroquinone	20 grs.	1·3 gm.
Sodium carbonate (crystals) ..	½ oz.	15 gms.
10 per cent. solution of potass. bromide	10 minims	0 6 c.c.s.
Water	10 ozs.	300 c.c.s.

This developer, as also the following Certinal developer, is also used for the "Ilford" Gaslight Lantern Plates:—

Certinal	32 minims	1 part
Water	1 oz.	15 parts

Ilford "Platona" (Platinum) Paper.

Developing Formula.—Stock Solution.

Potass. oxalate	2 ozs.	70 gms.
Potass. phosphate	½ oz.	17 gms.
Water	14 ozs.	500 c.c.s.

This solution is better if slightly acid; if it is not so, 60 grs. (5 gms.) oxalic acid should be added. If potassium phosphate is unobtainable, the sodium phosphate may be substituted, but the former is preferable. Dissolve the salts in hot water, and allow to cool. This solution will keep indefinitely.

For use, take 1 part stock solution and 1 part water.

Fixing.

Hydrochloric acid (pure)	1 oz.	12 c.c.s.
Water	80 ozs.	1,000 c.c.s.

Immerse prints for about five minutes each in three consecutive baths, and then give them a final washing in water for fifteen minutes.

Ilford Collodion Paper.

GOLD TONING.

Gold chloride	1½ grs.	0·1 gm.
Borax	40 grs.	2·5 gm.
Water	20 ozs.	600 c.c.s.

PLATINUM TONING.

Potass. chloroplatinite	4 grs.	0·25 gm.
Citric acid	40 grs.	2·5 gms.
Water	10 ozs.	300 c.c.s.

GOLD AND PLATINUM TONING.

For warm *Greenish-black* and *Blue-black* Tones. Tone the prints in the gold solution until they are a *Chocolate-brown*, then wash for ten minutes and tone as far as they will go in the platinum solution. The more the prints are toned in the gold solution the bluer will be the final result; and the less, the more greenish. Medium toning gives a beautiful *pure black*.

Ilford Lantern Plates.

"SPECIAL"—FOR BLACK TONES.

Metol-Hydroquinone Developer.

1.—Metol	50 grs.	5·6 gms.
Hydroquinone	25 grs.	2·8 gms.
Sodium sulphite	1 oz.	50 gms.
Water up to	20 ozs.	1,000 c.c.s.
2.—Sodium carbonate	1 oz.	50 gms.
Potass. bromide	30 grs.	3·4 gms.
Water up to	20 ozs.	1,000 c.c.s.

Equal parts of Nos. 1 and 2.

Hydroquinone Developer.

1.—Hydroquinone	.. .. ..	160 grs.	18·2 gms.
Sodium sulphite	.. .. ..	2 ozs.	100 gms.
Water up to	.. .. ..	20 ozs.	1,000 c.c.s.
2.—Sodium hydrate	.. .. ..	80 grs	9 1 gms.
Sodium sulphite	.. .. ..	30 grs.	3 4 gms.
Water up to	. .. ..	20 ozs.	1,000 c.c s.

No. 1, 1 part, No. 2, 1 part; water, 2 parts.

Certinal Developer.

Certinal	.. ..	16 minims	1 part
Water	.. ..	1 oz	30 parts

"ALPHA" PLATES—FOR WARM TONES

The only suitable developer is —

A —Hydroquinone	.. .. ..	80 grs.	9 1 gms.
Sodium sulphite	.. .. ..	1 oz.	50 gms.
Water to	.. .. ..	20 ozs.	1,000 c.c.s.
B – Sodium hydrate	.. ..	30 grs.	3 4 gms.
Potass. bromide	.. .. ..	15 grs.	1·7 gms.
Water	.. ..	20 ozs.	1,000 c.c s.

A, 1 oz., B, 1 oz

The hydroquinone solution should not be used after it has become yellow, as it loses its developing power.

TONING AND FIXING BATH.

The plates must be thoroughly washed after development and are fixed and toned in one operation by means of a combined bath The formula is —

Hypo	.. ..	2½ ozs	250 gms.
Ammonium sulphocyanide	..	¼ oz.	25 gms.
Gold chloride	.. .. ..	4 grs.	0 9 gm.
Water	.. ..	10 ozs	1,000 c c s.

The three salts should be dissolved in water and the gold chloride added last of all A convenient plan is to dissolve the hypo and sulphocyanide in 6 oz of water and then add 4 oz. of the stock solution of gold chloride (15 grains in 15 oz) used to make up the toning bath for P.O P. The bath should be made up a day or two before it is used.

When placed in this bath the plates fix rapidly and the image has a red or red brown colour if the exposure has been sufficient, but this colour gradually changes to brown, photographic purple, purple black, black, and finally blue, as the action of the bath is allowed to continue. The plate should be removed and well rinsed with water when its colour is somewhat warmer than that desired in the finished slide.

Of course if a red-toned slide is desired the plates should be simply fixed in plain hypo and if necessary modified by a short immersion in the toning bath. From 35 to 60 minutes toning is required in order to obtain a blue colour; photographic purple is obtained in about 15 minutes and purple black in about twenty-five.

GASLIGHT.

For developers, see under Ilford Gaslight Papers above.

THOS. ILLINGWORTH & CO., LTD.

Illingworth P.O.P.

SEPARATE TONING.

A.—Ammonium sulphocyanide	..	200 grs.	23 gms.
Water	..	20 ozs.	1,000 c.c.s
B.—Gold chloride	..	15 grs.	1 gm.
Water	..	15 ozs.	425 c.c.s.

Take :—A, 2 ozs ; water, 20 ozs. ; B., 2 ozs.

COMBINED BATH.

Hypo	..	2 ozs.	56 gms.
Lead acetate	..	16 grs.	1 gm.
Gold chloride	..	1 gr.	0·065 gm.
Common salt	..	1½ ozs.	42 gms.
Water (warm)	..	16 ozs.	450 c.c.s.

Dissolve the hypo and lead separately, each in 8 ozs., pour the lead solution into the hypo with vigorous stirring, then add the salt and gold and put aside to settle.

"Illingworth" Self-Toning Papers.

ZIGO.

For brown or purple tones place prints direct in

Hypo	..	4 ozs. (4 tablespoonfuls)	200 gms.
Water	..	20 ozs. (1 pint)	1,000 c.c.s.

For use at temperatures of 60 deg. In summer use bath half strength, or if red tones are desired.

Use bath in proportion of 1 oz. for every half-plate print.

ENITONE.

For brown and purple tones, fix in bath as given above for "Zigo." Use half strength for red tones.

Illingworth Bromide Paper.

AMIDOL DEVELOPER.

Amidol (diamidophenol)	..	50 grs.	5 gms.
Sodium sulphite (cryst.)	..	1¼ oz.	60 gms.
Potass. bromide .. .	..	10 grs.	1 gm.
Water	..	20 ozs.	1,000 c.c.s.

To be used within three days of mixing, otherwise it is best to make up as above, but without the amidol, adding this at time of use in proportion of 10 grs. per 4 ozs., or ½ gm. per 100 c.c.s.

Illingworth Gaslight Papers.

ZIGAS.

Developer.

Metol	7 grs.	1 6 gm.
Hydroquinone	30 grs	6·8 gms
Sodium sulphite	220 grs	50 gms.
Sodium carbonate . .	400 grs.	91 gms
10% bromide of potassium	30 to 40 drops	100 to 120 drops
Water	10 ozs	1,000 c c s.

The prints are fixed in an acid bath

SLOGAS

Developer

Metol	14 grs.	0 8 gm
Soda sulphite (cryst) ..	1 oz	25 gms.
Hydroquinone	60 grs	3 4 gms
Soda carbonate (cryst)	1 oz	25 gms.
Water ..	40 ozs	1,000 c c s

Add 10 per cent. potass bromide, 1 dr (3 c c.s), to the above stock solution, or in proportion to developer at time of use

Illingworth Carbon Tissues.

SENSITISER

Potass bichromate ..	7 ozs	42 gms.
Hot water ..	1 gallon	1,000 c c s
Ammonia, 0 880	3 drs.	2 c c.s

SPIRIT SENSITISER

Ammonium bichromate	1¼ oz	58 gms
Soda carbonate (cryst)	¼ oz	10 gms.
Water	25 ozs	1,000 c c s

Mix some of this stock solution with twice its bulk of methylated spirit This quick-drying sensitiser is applied with a flat brush to the tissue, which is hung up and dries within 10 minutes

IMPERIAL DRY PLATE CO., LTD.

Imperial Plates.

(*"Special Rapid," "Flashlight," "Orthochrome," and 'N F."*)

"STANDARD" DEVELOPER

No. 1.—Metol	45 grs.	5 gms.
Potass metabisulphite .. .	120 grs.	14 gms.
Pyrogallic acid	55 grs.	6 gms.
Potass bromide	20 grs.	2 gms
Water (boiled or distilled) to ..	20 ozs.	1,000 c c s
No. 2.—Sodium carbonate (washing soda)	4 ozs.	200 gms.
Water (boiled or distilled) to ..	20 ozs	1,000 c.c.s.

For use, take equal parts of No. 1 and No. 2.

"Universal" Developer.

No. 1.—Metol	..	40 grs.	5 gms.
Sodium sulphite	..	120 grs.	14 gms.
Hydroquinone	..	50 grs.	6 gms.
Potass. bromide	..	15 grs.	2 gms.
Water (boiled or distilled) to	..	20 ozs.	1,000 c.c.s.
No. 2.—Caustic potash	..	180 grs.	21 gms.
Water (boiled or distilled) to	..	20 ozs.	1,000 c.c.s.

For use, take equal parts of No. 1 and No. 2.

In making up No. 1 solution dissolve the metol in 12 ozs. of water at 95 deg., and the sulphite in 4 ozs. at 95 deg.; when both are completely dissolved mix and add the hydroquinone, and then the bromide, and make up to 20 ozs. For No. 2 begin with 16 ozs. of water at 95 deg.

Pyro-Soda Developer.

Stock Solution.

Potass. metabisulphite	..	50 grs.	10 gms.
Pyrogallic acid	..	1 oz.	83 gms.
Potass. bromide	..	60 grs.	13 gms.
Water (boiled or distilled) to	..	12 ozs.	1,000 c.c.s.
No. 1.—Stock solution	..	3 ozs.	150 c.c.s.
Water (boiled or distilled)	..	20 ozs.	1,000 c.c.s.
No. 2.—Sodium sulphite	..	2 ozs.	100 gms.
Sodium carbonate (washing soda)		2 ozs.	100 gms.
Water (boiled or distilled) to	..	20 ozs.	1,000 c.c.s.

For use, take equal parts of No. 1 and No. 2.

Hydroquinone Developer.

No. 1.—Potass. metabisulphite	..	10 grs.	1 gm.
Hydroquinone	..	150 grs.	16 gms.
Potass. bromide	..	50 grs.	6 gms.
Water (boiled or distilled) to	..	20 ozs.	1,000 c.c.s.
No. 2.—Sodium sulphite	..	2 ozs.	100 gms.
Caustic soda	..	100 grs.	11 gms.
Water (boiled or distilled) to	..	20 ozs.	1,000 c.c.s.

For use, take equal parts of No. 1 and No. 2.

After using this developer, always rinse the negative well before transferring to the fixing bath.

Single-Solution Developer.

Metol	..	50 grs.	5·5 gms.
Hydroquinone	..	40 grs.	4·5 gms.
Sodium sulphite	..	500 grs.	57 gms.
Potass. bromide	..	25 grs.	3 gms.
Sodium carbonate	..	500 grs.	57 gms.
Water (boiled or distilled) to	..	20 ozs.	1,000 c.c.s.

Imperial P.O.P.

SULPHOCYANIDE TONING BATH.

Stock Gold Solution.

	Chloride of gold	15 grs.	18 gms.
	Water (distilled or boiled) to ..	15 drs.	1,000 c.c.s.
No. 1.	—Ammonium sulphocyanide ..	60 grs.	6 8 gms.
	Water (boiled or distilled) to ..	20 ozs.	1,000 c.c.s.
No. 2	—Stock gold solution	5 drs.	31 c.c.s
	Water to	20 ozs	1,000 c.c.s.

For use, take equal quantities of No. 1 and No. 2

Add solution No. 2 slowly to solution No. 1, stirring all the time.

Imperial Self-Toning P.O.P.

Print exactly as P.O.P. and without any washing, immerse prints in—

Ammonium sulphocyanide ..	20 grs.	2 3 gms.
Powdered alum	1½ oz.	75 gms.
Water	20 ozs.	1,000 c.c.s.

The temperature of this bath should not be more than about 60 deg.

"Imperial" Bromide and Gaslight Papers.

A	—Metol	50 grs.	5·7 gms.
	Hydroquinone	40 grs.	4·6 gms
	Sodium sulphite	500 grs.	57 gms.
	Water to make	20 ozs	1,000 c.c.s.
B.	—Potass. bromide	25 grs.	2 8 gms.
	Sodium carbonate	500 grs.	57 gms.
	Water to make	20 ozs.	1,000 c.c.s.

Equal quantities of A and B.

Imperial "Special" Lantern Plates are developed with the hydroquinone formula given above for negative plates.

KENTMERE, LTD.

"Kentmere" P.O P.

Phosphate Toning Bath.

Gold chloride	2 grs.	0·11 gm.
Soda phosphate	60 grs.	3·42 gms.
Water	20 ozs.	500 c.c.s.
	or enough to cover prints.	

This bath is recommended for toning cards or prints in quantities, 2 grains of gold toning about 100 post-cards. The more water added the slower the toning. Use enough water to allow of cards being moved easily and quickly.

"Kentmere" Self-Toning P.O.P.

Place into one of the following fixing baths with or without previous washing. Do not let fixing bath be too cold.

For Red Brown Tones.		*For Purple Tones.*	
Hypo	4 ozs.	Hypo	6 ozs.
Water	1 pint.	Water	1 pint.

Remove from bath immediately desired tone is reached, which should not be less than five minutes or more than eight.

"Kentmere" Bromide and Gaslight Papers.

Developers.

	Bromide.		Gaslight.	
Metol ...	10 grs.	1·14 gm. ..	14 grs.	1·60 gm.
Hydroquinone	30 grs.	3·42 gms. ...	60 grs.	6·84 gms.
Water to ...	20 ozs.	1,000 c.c.s. ...	20 ozs.	1,000 c.c.s.
Dissolve and add—				
Soda sulphite ...	¾ oz.	37·5 gms.	1 oz.	50 gms.
Soda carbonate...	¾ oz.	37·5 gms. ...	1 oz.	50 gms.
Potass. bromide	10 grs.	1·14 gm. ...	6 grs.	0·68 gm.

KODAK, LTD.

Kodak Film, Kodoids and Film Packs.

Pyro Developer.

A.—Pyrogallic acid	1 oz.	30 gms.
Sulphuric acid	20 minims	1 c.c.
Water	28 ozs.	900 c.c.s.
B.—Sodium sulphite	6 ozs.	180 gms.
Sodium carbonate crystal ..	4 ozs.	120 gms.
Water	28 ozs.	900 c.c.s.

A, 1 oz.; B, 1 oz.; water, 8 ozs.

Metol-Hydroquinone.

A.—Metol	60 grs.	7 gms.
Hydroquinone	30 grs.	3·5 gms.
Sodium sulphite	1½ ozs.	75 gms.
Water	20 ozs.	1,000 c.c.s.
B.—Sodium carbonate	1 oz.	50 gms.
Water	20 ozs.	1,000 c.c.s.

A, 1 oz.; B, 1 oz.; water, 2 ozs.

Add 1 or 2 drops 10 per cent. solution potassium bromide to each oz of developer.

Eastman Plates.

Developer.

A.—Water	.. ..	32 ozs.	1,000 c.c.s.
Potassium metabisulphite	.	60 grs	4 gms.
Potass. bromide	.. .. .	60 grs.	4 gms.
Pyro	.. ..	1 oz.	30 gms.
B.—Water	.. .	32 ozs.	1,000 c.c.s.
Sodium sulphite	. .	8 ozs.	250 gms.
C.—Water	.. . . .	32 ozs.	1,000 c.c.s.
Sodium carbonate	.. ..	8 ozs.	250 gms.

A, 2 parts; B, 2 parts; C, 2 parts, water, 3 parts.

Seed Plates.

Developer.

A.—Pyro	.. ..	1 oz.	60 gms.
Soda sulphite crystal	.	4 ozs	240 gms.
Sulphuric acid	.. .. ..	5 drops.	none.
Water	.. . .. .	16 ozs	1,000 c.c.s
B —Soda carbonate crystal	.. ..	4 ozs	240 gms
Water	.. ..	16 ozs.	1,000 c c.s.

For use, A, 1 oz : B, 1 oz. ; water, 8 ozs.

Kodak Solio P.O.P.

Toning Bath Stock Solution.

Gold chloride	.. .. ..	15 grs. (1 tube)	1 gm.
Ammonium sulphocyanide	..	150 grs.	10 gms.
Water to	.. ..	30 ozs.	1,000 c c.s

The sulphocyanide should be dissolved first and the gold added afterwards. Each ounce contains ½ gr. of chloride of gold.

To impart to a 1s. packet of paper a cold purple-black tone take 6 ozs. of the stock solution and dilute with water to measure, say, 30 ozs. Treat all the prints at the same time, and allow them to remain in the bath for eight minutes, keeping them in motion as usual in toning.

For a purple-brown colour a packet of paper requires 3 ozs. of stock solution, or for a brown colour 1½ oz of stock solution, whilst 1 oz. of stock solution will give a red tone.

The amount of water to be added to the stock solution is in all cases just as much as is considered necessary for conveniently handling the prints.

Wash the batch of the prints well for 10 minutes in running water (or in three changes of water). Transfer as rapidly as possible the whole of them, one by one, to the toning bath.

Tone for 8 or 10 minutes, moving the prints all the time, and rinse well before fixing.

COMBINED TONING AND FIXING BATH.

A.—Hypo	.. .. ..	6 ozs.	200 gms.
Ammonium sulphocyanide		48 grs.	4 gms.
Water	.. .. ..	32 ozs.	1,000 c.c.s.
B.—Gold chloride	.. ..	15 grs. (1 tube)	1 gm.
Lead acetate	.. ..	150 grs.	10 gms.
Water	.. .. ..	16 ozs.	500 c.c.s.

Take 7 parts of A to 1 part of B. Print decidedly darker than for ordinary bath. Wash thoroughly and tone in this bath. Red to dark brown tones.

Platinum Toning for Matt "Solio."

Potassium chloroplatinite	..	5 grs.	1 gm.
Citric acid	.. ..	40 grs.	8 gms.
Sodium chloride (salt)	.. ..	40 grs.	8 gms.
Water	.. ..	20 ozs.	1,000 c.c.s.

This bath keeps well for a month.

Wash the prints from 5 to 10 minutes, and then immerse in the above bath, examining the prints by transmitted light.

Tone to a dark brown or chocolate colour (not black), rinse slightly, and immerse the prints in the following bath to stop the toning action :—

Sodium carbonate (washing soda)		½ oz.	15 gms.
Water	.. ..	20 ozs.	600 c.c.s.

Rinse and transfer to the following fixing bath :—

Hypo	.. ..	3 ozs.	150 gms.
Water	.. ..	20 ozs.	1,000 c.c.s.

Wash thoroughly in running water or in frequent changes for one hour.

DEVELOPING "SOLIO."

Develop with the following developer until the prints look similar to printed-out prints, but rather more brown in colour ; this should take 5 or 6 minutes.

Hydroquinone	.. .. ..	26 grs.	2 gms.
Citric acid	.. ..	60 grs.	5 gms.
Sodium acetate	.. .. ..	1½ oz.	50 gms.
Water	.. ..	30 ozs.	1,000 c.c.s.

Wash for about 15 minutes. The prints will continue to develop very slightly, and for this reason care should be taken not to develop them too dark. Then tone in the sulphocyanide or combined toning and fixing bath in the usual way

KODAK "SOLIO" NO. 2.

The sulphocyanide bath for cold tones is that already given for ordinary "Solio."

For warm tones the following stock solution is prepared :—

Gold chloride	.. .. ..	15 grs.	1 gm.
Water	.. ..	30 ozs.	1,000 c.c.s.

Take 1 part of the stock solution to 10 parts of water. Neutralise exactly with a saturated solution of borax, add one drop at a time, stir

and test with litmus paper, repeating this operation until the bath does not alter the colour of blue or red litmus paper. This borax toning bath is ready for use at once, but will not keep.

PLATINUM TONING FOR MATT SOLIO NO. 2.

To obtain rich sepia tones make up the following stock solutions :—

Potassium chloroplatinite ..	15 grs.	1 gm.
Citric acid	2 drs.	8 gms.
Sodium chloride (common salt) ..	2 drs.	8 gms.
Water	30 ozs.	1,000 c.c.s.

For use, take 1 part of the stock solution and add 20 parts of water. Tone until the high-lights are clear, which takes about 5 minutes, and then immerse the prints in the following bath to stop further toning:—

Sodium carbonate (washing soda crystals)	½ oz.	15 gms.
Water	20 ozs.	600 c.c.s.

Again rinse and fix, etc., as already described.

Kodak Collodio-Chloride Papers.

Matt.

When the prints are sufficiently washed and ready to tone, they are first placed in a plain gold bath, made alkaline with borax, enough to turn red litmus paper blue in one minute.

Gold chloride	2½ grs.	0·16 gm.
Water	60 ozs.	1,700 c.c.s.

Add sufficient of a saturated solution of borax to make bath very slightly alkaline (about 25 to 30 drops). The bath should be made up one to two hours before use.

Tone in this bath to chocolate brown in the deepest shadows by transmitted light. Add gold enough to keep the speed of the bath 6 to 8 minutes. If the prints show bleaching in the half-tones before the shadows are toned far enough, add more borax. The alkali acts as a restrainer on the half-tones. The amount to use is the amount necessary to hold the half-tones from bleaching while the shadows tone. When the prints are toned, place in clear water; and when all are toned, wash in three changes of water and tone in platinum bath.

KODAK GLOSSY C.C. PAPER.

Print considerably darker than desired when finished and after washing tone in the following bath:—Water 60 ozs., kodak gold solution 2 drachms (or, if dry chloride of gold is used, 2 grains), and ½ drachm of dry acetate of soda. Add a few drops of saturated solution of borax, enough to make the bath slightly alkaline. Allow to stand 2 or 3 hours before using.

For Dark Tones.

Water	32 ozs.	900 c.c.s.
Ammonium sulphocyanide ..	½ oz.	14 gms.
Gold chloride	2 grs.	0·13 gm.

ARISTO-PLATINO C.C. PAPERS.

Gold Toning Baths.

Salt	30 grs.	0·68 gm.
Gold chloride	4 grs.	0·1 gm.
Water	100 ozs.	1,000 c.c.s.

Add saturated borax solution enough to turn red litmus paper blue in half a minute.

ARISTO JUNIOR

Salt	20 grs.	0·9 gm.
Sodium acetate (saturated solution)	½ oz	8 c.c.s
Gold chloride . . .	2 grs	0 07 gm
Water	60 ozs.	1,000 c.c s.

Add saturated solution of soda carbonate or borax, enough to turn red litmus paper blue in 1 to 2 minutes. Bath is made up 4 to 5 hours before use and should tone in 6 to 8 minutes

For dark tones on "Aristo Junior," the following bath is used :—

Ammonium sulphocyanide ..	½ oz.	14 gms.
Gold chloride	2 grs.	0·13 gm.
Water	32 ozs.	900 c.c.s.

Kodak Self-Toning Papers.

"SOLIO" (GELATINE) P.O P.

Put the prints, without previous washing, into the following bath, and keep them moving for 3 to 5 minutes.

Ammonium sulphocyanide ..	20 grs.	2 gms.
Water	20 ozs.	1,000 c.c.s.

Wash for 5 minutes in running water, or several changes, and fix in—

Hypo . .	3 ozs.	150 gms.
Water	20 ozs.	1,000 c.c.s.

for 10 minutes. Then wash in running water for one hour, or in 15 to 16 changes.

Specially for matt paper—put the prints, without previous washing, into the following bath —

Salt	1 oz.	50 gms.
Water	20 ozs.	1,000 c.c.s.

for 5 minutes, and then place in the above fixing bath.

COLLODION, GLOSSY AND MATT.

For cold, purple brown tones, immerse without previous washing directly into fixing bath of hypo, 2½ ozs ; water, 20 ozs , for 10 minutes.

For warm brown tones, wash in three changes of cold water, and transfer for 10 minutes to fixing bath

For darker tones, put the print directly into salt, 60 grs.; water 20 ozs., for three minutes, and then transfer to the fixing bath for 10 minutes.

"ARISTO" COLLODION.

For Warm Tones.

Wash in two changes and fix for 15 minutes in 1 : 8 hypo, made slightly alkaline with ammonia; transfer for 10 minutes to 1 . 20 salt bath and wash.

For Cold Tones.

Treat for 5 minutes in 1 . 60 salt bath, take out into clean water, fix for 15 minutes in 1 : 8 hypo bath, and transfer (for 10 minutes) to 1 : 20 salt bath, finally washing as usual.

Kodak Bromide Papers.

"Permanent," "Platino-Matte," "Royal," "White Royal," "Nikko," and "Velvet."

Metol-Hydroquinone Developer.

Metol	8 grs.	0·9 gm.
Hydroquinone	30 grs.	3·5 gms.
Sodium sulphite	¾ oz.	38 gms.
Sodium carbonate	¾ oz.	38 gms.
10% solution potassium bromide	20 minims	1 c.c.
Water	20 ozs.	1,000 c.c.s.

Amidol Developer.

Amidol	60 grs.	1·8 gm.
Sodium sulphite	1 oz.	50 gms.
10% solution potassium bromide	20 drops	1·5 c.c.s.
Water	20 ozs.	1,000 c.c.s.

HYPO-ALUM SEPIA TONING.

Hypo	10 ozs.	280 gms.
Alum	1 oz.	28 gms.
Boiling water . .	70 ozs.	2,000 c.c.s.

Dissolve the hypo in the water, and then add the alum slowly. When all is dissolved the solution should be milk white. This solution should not be filtered, and it works better as it becomes older; it may be strengthened from time to time with a little fresh solution. Never throw the bath away entirely, but replenish it in the manner stated. The best results are obtained on prints developed by the above amidol formula, and by keeping the bath hot, or as warm as the emulsion will stand, say 100 to 120 deg F. In this bath prints will tone in 30 to 40 minutes.

When toned, the prints should be placed in a tepid solution of—

Water	70 ozs.	2,000 c.c.s.
Alum	2 ozs.	60 gms.

then washed thoroughly.

Velox (Gaslight) Paper.

DEVELOPER.

Dissolve in the order given :—

Metol	7 grs.	0·5 gm.
Hydroquinone	30 grs.	2 gms.
Sodium sulphite (cryst.) ..	220 grs.	15 gms.
Sodium carbonate (cryst.) ..	400 grs.	27 gms.
10% sol. of potass. bromide ..	10 to 20 drops	10 to 20 drops.
Water, up to	10 ozs.	300 c.c.s.

For *Vigorous Grade*, use above full strength; for *Soft (or Special) Grade*, dilute with equal bulk of water.

ACID FIXING BATH.

Hypo	32 ozs.	500 gms.
Water, to make	128 ozs	2,000 c.c.s.

To this add the following hardening bath :—

Soda sulphite cryst. .	2 ozs	30 gms.
Acetic acid, glacial . .	1½ ozs	24 c c.s.
Alum	2 ozs.	30 gms.
Water	10 ozs	150 c.c.s.

20 ozs. of this bath suffices to fix ½ gross 5 by 4 prints.

Platinum Papers.

Developer for Kodak Warm Black Tones

Neutral potassium oxalate ..	4 ozs	200 gms.
Water	20 ozs.	1,000 c c.s

For Bluer Tones.

Neutral potassium oxalate ..	2 ozs.	100 gms
Potassium phosphate	1 oz	50 gms.
Water	20 ozs.	1,000 c c s.

Any potassium phosphate will do for this developer, but the one which gives by far the best results, and should be used if obtainable is the mono-potassium di-hydric ortho-phosphate (KH_2PO_4).

The temperature of the developer should be from 60 deg to 65 deg. F

Clearing bath :—Hydrochloric acid, ½ oz ; water, 20 ozs

ARISTO.

Developer.

Potass. oxalate neutral	2 ozs.	200 gms.
Water	10 ozs.	1,000 c.c s.

Prints are cleared in hydrochloric acid, 1 part; water 60 parts.

"Eastman" Lantern Plates.

*BLACK TONE.

Developer.

A.—Hydroquinone	.. .. ..	124 grs.	8 gms.
Soda sulphite (cryst.)	.. ..	250 grs.	20 gms.
Potass. bromide	.. .. ..	16 grs.	1 gm.
Potass. metabisulphite	.	8 grs.	½ gm.
Water, to make	. ..	20 ozs.	600 c.c.s.
B.—Potass. hydrate	.. ..	180 grs.	12 gms.
Water, to make	.. .. .	20 ozs.	600 c.c.s.

Mix equal parts of A and B. Time of development about ½ minute at 65 deg. F.

LETO PHOTO-MATERIALS CO., LTD.

Edwards Plates.

"ISO" AND "ORDINARY" PLATES.

A.—Pyro	.. ..	¼ oz.	12·5 gms.
Soda metabisulphite	.. ..	¼ oz.	12·5 gms.
Water	.. . .	20 ozs.	1,000 c.c.s.
B.—Soda carbonate	.. .. ..	3 ozs.	150 gms.
Soda sulphite	.. .. ..	1 oz.	50 gms.
Water	.. ..	20 oz.	1,000 c.c.s.

Use equal parts of A and B, adding 2 to 3 minims of 10 per cent. potass. bromide solution as necessary per oz. of developer.

"SPECIAL TRANSPARENCY" LANTERN PLATE.

For Warm Tones

A.—Pyro	.. ..	1¼ oz.	62·5 gms.
Soda sulphite	.. .. ..	5 ozs.	250 gms.
Citric acid	.. ..	140 grs.	16 gms.
Water to make	.. .. ..	20 ozs.	1,000 c.c.s.
B.—Ammonium bromide	.. ..	3¾ ozs.	187 gms.
Liquor ammonia (880)	.. ..	2½ ozs.	125 c.c.s.
Water to make	.. .. ..	20 ozs.	1,000 c.c.s.

Use:—A, 1 part; B, 1 part; water, 12 parts.

"KRISTAL" (GASLIGHT) LANTERN PLATES.

Developer for Warm Black Tones.

Hydroquinone	.. .. ..	120 grs.	14 gms.
Soda sulphite	.. ..	2 ozs.	100 gms.
Potass. carbonate	.. .. ..	4 ozs.	200 gms.
Potass. bromide	.. .. ..	40 grs.	4·5 gms.
Water to make	.. .. ..	20 ozs.	1,000 c.c.s.

Use 1 part of the above mixed with 1 part of water. Development should be complete in about 2 minutes.

Leto Collodion Papers.

PLATINO-MATT.

For Brown-Black and Warm Black Tones.

The prints are first partly toned in the following gold bath. Toning must not be carried on too far, but only until the prints seem to have changed colour. A long immersion will yield blue-black and a short immersion brown-black tones in the subsequent platinum bath.

Shortly before use only, make up as follows:—

Acetate of soda	1 oz.	30 gms.
Gold chloride	1 gr.	0·065 gm.
Water	17 ozs.	530 c.c.s.

After toning, wash for a minute or two, and continue in the following platinum bath, until the desired effect has been obtained:—

Phosphoric acid	2 drs.	7·1 c.c.s.
Chloroplatinite of potash ..	7½ grs.	0·48 gm.
Water	9 ozs.	250 c.c.s.

Then wash in two to three changes of water and fix.

"JUNO" COLLODION P.O.P.

Toning Bath.

Ammonium sulphocyanide ..	90 grs.	10·3 gms.
Gold chloride	3 grs.	0·3 gm.
Water	20 ozs.	1,000 c.c.s.

Fix for at least fifteen minutes in:—

Hypo	1 oz.	Water ..	15 ozs.

"PLUTO" COLLODIO-CHLORIDE PAPER.

Platinum Toning Bath.

Citric acid	90 grs.	10·3 gms.
Potass. chloroplatinite	3 grs.	0·3 gm.
Water	20 ozs.	1,000 c.c.s.

Brown Tones.—Do not print so deeply as for black tones. Wash in four changes of *lukewarm* water, and immerse in a very weak ammonia bath (say ¼ oz. to 40 ozs. water) until they turn a uniform lemon yellow. Wash out the ammonia from the prints in at *least* six changes of water, and tone in the above platinum bath, and fix as usual. (It is important that the prints be free from ammonia to avoid staining in the platinum bath.)

Excellent warm sepia tones are obtained by first washing the prints as usual, and placing direct into the fixing bath (hyposulphite of soda, 1 oz., water, 15 ozs.). Fix for 15 minutes, and wash for 1 to 1½ hours in several changes. Printing must not be carried on so far as for warm black tones.

Seltona (Self-Toning) Collodion Paper.

For Warm Brown Tones.

Soak the prints for a minute or two in clean water, and place in the fixing bath as follows:—

Hypo	2 ozs.	100 gms.
Water	20 ozs.	1,000 c.c.s.

(It is advisable to add a pinch of bicarbonate of soda to this solution.)

Fix for at least 12 to 15 minutes, then wash for 1 hour in running water, or 8 to 10 changes.

Dark Brown, Purple and Blue Tones.

Rinse the prints rapidly in two or three changes of clean water, and place for 5 to 10 minutes in the following:—

Common salt	1 oz.
Water	12 ozs.

or 4 good teaspoonfuls to ½ pint water. Rinse in clean water and fix as above.

Darker and bluer tones are obtained by placing the prints *direct* into the salt solution without previous washing. A stronger solution of salt up to 2 ozs. in 10 ozs. may be employed if desired.

Leto-Tintona Paper.

For sepia tones the prints are fixed in 1 in 20 hypo after washing.

For brown and purple tones, they are printed a little deeper and placed direct into—

Common salt	1 oz.	100 gms.
Water	10 ozs.	1,000 c.c.s.

for 10 minutes, being afterwards fixed and washed as for sepia tones.

For black tones, the paper is much over-printed and toned in—

Citric acid	90 grs.	10 3 gms
Sodium chloride .. .	90 grs.	10 3 gms.
Potass. chloroplatinite	3 grs.	0 34 gm.
Water	20 ozs.	1 000 c.c s

This deep printing and platinum bath are also used for Leto "Chamois" paper.

Leto "Bromide" Paper.

Amidol Developer.

Amidol	45 grs.	5 1 gms.
Soda sulphite	450 grs.	51 gms.
Potass bromide	5 grs.	0·6 gm.
Water	20 ozs.	1,000 c.c.s.

An "acid" fixing bath is preferable: Soda sulphite, 1¼ oz.; water, 50 ozs., to which add, drop by drop, glacial acetic acid, 2 drachms; and then hypo, 8 ozs.

Leto-Gaslight Paper.

For Warm Black Tones.

A.—Adurol-Schering	½ oz.	7·1 gms.
Soda sulphite, cryst.	2 ozs.	56·7 gms.
Water	12½ ozs.	350 c.c.s.
B.—Potass. carbonate..	1½ oz.	42·5 gms.
Water	12½ ozs.	350 c.c.s.

Shortly before use, mix equal parts of each.

For Pure Black Tones.

Sodium carbonate	1½ oz.	150 gms.
Sodium sulphite	¼ oz.	25 gms.
Metol	10 grs.	2·3 gms.
Hydroquinone	30 grs.	6·8 gms.
Potass. bromide (10 per cent. solution)	4 minims	9 c.c.s.
Water	10 ozs.	1,000 c.c.s.

For correct exposure development should be complete in 10 to 30 seconds.

It is advisable to give plenty of exposure, and develop quickly. When fully developed rinse and fix.

THE LUMIERE CO.

Lumiere Plates and Films.

Dianol (Diamidophenol) Developer.

Sodium sulphite anhydrous ..	300 grs.	30 gms.
Dianol	50 grs.	5 gms.
Water	20 ozs.	1,000 c.c.s.

This solution should be used quite fresh.

Lumiere's Citrate P.O.P.

Any of the ordinary toning methods may be employed, but the makers specially recommend the use of the following combined toning and fixing bath.

A.—Hypo	5 ozs.	250 gms.
Alum	130 grs.	15 gms.
Lead acetate	18 grs.	2 gms.
Warm water	20 ozs.	1,000 c.c.s.

Dissolve the hyposulphite and alum, and when cold add the lead acetate. Allow to stand for several hours, and then filter carefully.

B.—Gold chloride	15 grs.	1 gm.
Water	3½ ozs.	100 c.c.s.

To 100 parts of A add from 6 to 8 parts of B, according to tone required.

Separate Toning and Fixing.

Refined chalk	1½ oz.	80 gms.
1 per cent. solution of gold chloride	2 ozs.	100 c.c.s.
Distilled water	20 ozs.	1,000 c.c.s.

Allow to stand for 24 hours, then filter, and for use add 15 parts of above bath to 100 parts of water.

After toning, rinse prints and transfer to a 1 per cent. solution of alum for a few minutes, wash well, and fix in—

Fixing Bath.

Hypo	3 ozs.	150 gms.
Soda bisulphite	1½ dr.	10 c.c.s.
Alum	30 grs.	3 gms.
Water	20 ozs.	1,000 c.c.s.

In this bath the prints will turn to a yellowish red, but will then change rapidly through brown to blue. Take the prints from the bath when the desired tone is obtained, and wash, preferably in running water.

Lumiere "Actinos" P.O.P.

Separate Toning.

A.—Sodium acetate	350 grs.	40 gms.
Water	20 ozs.	1,000 c.c.s.
B.—Ammonium sulphocyanide ..	175 grs.	20 gms.
Water	20 ozs.	1,000 c.c.s.
C.—Gold chloride	15 grs.	1 gm.
Water	3½ ozs.	100 c.c.s.

Mix at time of use, A, 4 parts; B, 4 parts; C, 1 part.

Lumiere Bromide Papers.

The developer most recommended is as follows:—

Sodium sulphite (anhydrous) ..	190 grs.	20 gms.
Dianol	45 grs.	5 gms.
10 per cent. solution of potass. bromide	20 to 50 min.	2 to 5 c.c.s.
Water	20 ozs.	1,000 c.c.s.

This developer should be freshly made for each batch of prints, but should it be desired the soda solution can be made in bulk, and the dianol added at the time of use.

Lumiere "Radios" (Gaslight) Paper.

Developer for Black Tones.

Sodium sulphite (anhydrous) ..	5 to 7 drs.	30 to 50 gms.
Dianol	40 grs.	5 gms.
Potass. bromide (10 per cent. solution)	25 drops	40 to 50 drops
Water	20 ozs.	1,000 c.c.s.

For Warm Tones.

Hydroquinone	5 drs.	10 gms.
Formosulphite	14 drs.	25 gms.
Potass. bromide (10 per cent. solution)	5 drs.	10 c.c.s.
Water	20 ozs.	250 c.c.s.

Taking as a standard exposure that correct for black tones with developer given, and as a standard developer the above given for warm tônes, the exposure and dilution of the developer for various tones should be as follows:—

	Greenish Blue.	Green.	Brown.	Sepia.	Red.
Exposure	1	2	3	4	6
Addition of water to developer	0	1	2	3	7

Autochrome Plates.

No. 1.—DEVELOPER, ALSO RE-DEVELOPER

Distilled water	35 ozs.	1.000 c.c.s.
Quinomet	½ oz.	15 gms.
Soda sulphite, anhydrous ..	3½ ozs.	100 gms.
Ammonia 0 920 (22 deg Baume)	9 drs.	32 c.c s.
Potass. bromide	90 grs.	6 gms.

For one half-plate use 1 oz. of solution diluted with 4 ozs. water, developing correct exposures for 2½ minutes at 60 deg. F. Rinse plate and transfer to reversing bath, after which daylight may be used.

No. 2.—REVERSAL

Water	35 ozs.	1,000 c.c.s.
Potass. permanganate	30 grs.	2 gms.
Sulphuric acid	3 drs.	10 c.c.s.

The plate is re-developed (in full daylight) in the solution which was used for the first development, and, when the high-lights are completely darkened (3 to 4 minutes), washed for 3 or 4 minutes and put to dry. There is no need to fix unless the plate is intensified.

Intensifying.

When it is desired to intensify, the following solutions are prepared.

Destroying Second Developer.

E.—Solution No. 2	20 c.c.s.	1 oz.
Water	1,000 c.c.s.	50 ozs.

Intensifier.

F.—Pyro	3 gms.	26 grs.
Citric acid..	3 gms.	26 grs.
Water	1,000 c.c s.	20 ozs.
G.—Silver nitrate	5 gms.	90 grs.
Distilled water	100 c.c.s.	4 ozs.

Clearer.

H.—Potass. permanganate	..	1 gm.	9 grs.
Water	..	1,000 c.c.s.	20 ozs.

Fixing Solution.

I.—Hypo	..	150 gms.	3 ozs.
Soda bisulphite (solution)	..	50 c.c.s.	1 oz.
Water	..	1,000 c.c.s.	20 ozs.

Potass. metabisulphite (7 gms. or 60 grs.) may be used in place of the soda bisulphite solution in making the fixing bath.

Wash plate for a second or two from re-developer, place for 10 or 15 seconds in E, rinse for a second or two, and make up intensifier by taking :—

F. Solution	..	3½ ozs.	100 c.c.s.
G. Solution	..	3 drs.	10 c.c.s.

This mixture must be thrown away as soon as it becomes turbid and fresh mixed up. When intensified rinse, place for 30 seconds in H, wash for a few seconds, and fix in I for 2 minutes, finally washing for 5 minutes.

MARION AND CO., LTD.

Marion Plates.

(*"Supreme," "Academy," P.S., etc.*)

PYRO-SODA DEVELOPER.

A.—Pyrogallic acid	..	1 oz.	12·5 gms.
Sodium sulphite	..	8 ozs.	100 gms.
Sulphuric acid	..	60 minims	1·5 gm.
Water to make up ..	..	80 ozs.	1,000 c.c.s.
B.—Sodium carbonate ..	..	8 ozs.	100 gms.
Potassium bromide ..	..	60 grs.	1·5 gm.
Water to make up ..	..	80 ozs.	1,000 c.c.s.

Mix in equal parts at time of using.

When very soft negatives are required or only a minimum exposure can be given, the bromide may be omitted.

PYRO-AMMONIA.

A.—Pyrogallic acid	..	1 oz.	100 gms.
Ammonium bromide ..	..	1 oz.	100 gms.
Citric acid	..	60 grs.	12 gms.
Water to make up ..	..	10 ozs.	1,000 c.c.s.
B.—Strongest liquid ammonia (0·880)		1½ oz.	150 c.c.s.
Water to make up ..	..	10 ozs.	1,000 c.c.s.

Two ozs. (200 c.c.s.) of each of above separately made with water to 20 ozs. (1,000 c.c.s.) form the solutions for use, equal parts being mixed together at the time of development.

Mariona P.O.P.

Toning Bath for Matt and Glossy.

A.—Gold chloride solution, 1 gr. per oz. (1 gm. per 430 c.c.s.).

B.—Ammonium sulphocyanide solution, 10 grs. per oz. (23 gms. per 1,000 c.c.s.).

Toning Bath.—A, 1 oz.; B, 1 oz.; water to 8 to 12 ozs.

For Glossy Only.

A.—Gold chloride, as above.

B.—Sodium carbonate..	30 grs.	4·6 gms.
Water	15 ozs.	1,000 c.c.s.

A, 2½ ozs.; B, 2½ ozs.; water to make 20 to 30 ozs.

Platinum Toning for Matt P.O.P. and Mezzotint Paper.

A.—Water	15 ozs.	1,000 c.c.s.
Hydrochloric acid	5 minims	0·3 c.c.
Potass. chloroplatinite	15 grs.	2·3 gms.
B.—Citric acid	300 grs.	4·6 gms.
Sodium chloride	300 grs.	4·6 gms.
Water	15 ozs.	1,000 c.c.s.

A, 1 oz.; B, 1 oz.; water to 30 ozs.

Marion's Collodion P.O.P.

For Warm Black Tones—Platinum Toning Bath.

Potass. chloroplatinite	15 grs.	1 gm.
Phosphoric acid (sp. gr. 1·120) ..	2½ drs.	9 c.c.s.
Water	35 ozs.	1,000 c.c.s.

Remove prints as soon as they are of desired tone, which will be in from two to six minutes, according to age of bath. Wash well before fixing.

Blue-Black Tones—Gold Toning Bath.

Gold chloride	2 grs.	0·13 gm.
Borax	80 grs.	5 gms.
Water	25 ozs.	700 c.c.s.

Make up two hours before use.

Keep prints in this bath until they assume a purple tone, then wash in several changes of water and transfer to platinum bath (given above). Remove when they reach a rich black.

Sepia Tones.

Wash prints in five or six changes of luke-warm water, to the last three of which add 1 per cent. of liquid ammonia 0·880 (not stronger, or blisters will be produced). When lemon-yellow wash in five or six changes of water and tone in the platinum bath. Wash and fix as usual.

Red Carbon Tones.

Wash prints in three changes of water, then place in a bath of—

Common salt	.. ..	1 teaspoonful
Water	.. ..	40 ozs.

As soon as they become yellow remove, rinse in water, and place in the borax gold bath. Just as they are reaching tone desired, again place them in salt bath to stop further toning, and, after rinsing in water, fix as usual.

Brown and Dark-Blue Tones.

Print dark, and treat as for red carbon tones, but tone in platinum bath only.

Purple Tones.

Print very dark. Wash in three changes of water and place in the following bath :—

Gold chloride (1 per cent. solution)	1 oz.	10 c.c.s.
Acid hydrochloric pure	3 ozs.	30 c.c.s.
Water	10 ozs.	100 c.c.s.

Less acid gives a blue tone. More acid gives a purple tone. Tone until desired colour is obtained. Wash and fix as usual.

Marion's Bromide Paper.

Amidol Developer.

Amidol	40 grs.	4·6 gms.
Sodium sulphite	400 grs.	46 gms.
Potass. bromide	10 grs.	1·1 gm.
Water to make up to	20 ozs.	1,000 c.c.s.

Or other standard developer.

Marion's "Quick Print (Gaslight)" Paper.

Amidol Developer.

Sodium sulphite	200 grs.	46 gms.
Amidol	20 grs.	4·6 gms.
Potass. bromide (10% solution) ..	10 drops	35 drops
Water	10 ozs.	1,000 c.c.s.

Adurol Developer for Cold Tones.

Adurol	20 grs.	4·6 gms.
Sodium carbonate	200 grs.	46 gms.
Sodium sulphite	200 grs.	46 gms.
Potass. bromide	5 grs.	1 gm.
Water to	10 ozs.	1,000 c.c.s.

Time of exposure with average negative, one inch magnesium ribbon burnt at one foot distant. Time of development, one minute.

For warm tones add extra bromide in proportion of 1 gr. per oz. (2·3 gms. per litre), and give exposure with average negative of six inches magnesium ribbon burnt to one foot distant. Time of development, four minutes.

Marion's Lantern Plates.

(Gelatino-Chloride and Chloro-Bromide.)

Hydroquinone	15 grs.	3·4 gms.
Metol	5 grs.	1·1 gm.
Sodium sulphite	200 grs.	45·6 gms.
Potass. bromide	2 grs.	0·45 gm.
Sodium hydrate	20 grs.	4·6 gms.
Water to make	10 ozs.	1,000 c.c.s.

MAWSON AND SWAN.

Mawson Plates.

("*Mawson*," "*Castle*," "*Electric*," "*Felixi*," *and* "*Gladiator*.")

PYRO-SODA DEVELOPER.

Stock Solution.

Pyrogallic acid	480 grs.	110 gms.
Potass. metabisulphite	120 grs.	28 gms.
Distilled water to make	10 ozs.	1,000 c.c.s.

Dissolve the metabisulphite before adding the other ingredients.

A.—Stock solution	$1\frac{1}{4}$ ozs.	125 c.c.s.
Distilled water to make	10 ozs.	1,000 c.c.s.
B.—Sodium carbonate (cryst.) ..	360 grs.	82 gms.
Sodium sulphite	480 grs.	110 gms.
Distilled water to make	10 ozs.	1,000 c.c.s.

Use equal parts of A and B.

RODINAL DEVELOPER.

Rodinal	1 part
Water	20 parts

Mawson Ortho Plates, A. & B.

The above pyro-soda formula, with the addition of 40 grs. (9 gms.) potass. bromide to the stock solution, gives excellent results.

If under-exposed, use a large proportion of B; if over-exposed, decrease the proportion of B, and add a few drops of a 10 per cent. solution of potass. bromide.

AMIDOL DEVELOPER.

Amidol	100 grs.	23 gms.
Soda sulphite	1,000 grs.	228 gms.
Potass. bromide	10 grs.	2·3 gms.
Distilled water to make to ..	10 ozs. (fl.)	1,000 c.c.s.

Use 1 part to 3 parts water.

Mawson Photo-Mechanical Plates.

Pyro-Soda Developer.

The pyro-soda developer given above for Mawson "Castle" plates is used with the addition to the pyro stock solution of:

Potass. bromide	160 grs.	38 gms.

Hydroquinone Developer.

A.—Hydroquinone	40 grs.	9 gms.
Potass. bromide	10 grs.	2 gms.
Potass metabisulphite .. .	40 grs.	9 gms.
Distilled water to make up to (fl.)	10 ozs.	1,000 c.c.s.
B.—Caustic potash (sticks)	80 grs.	18 gms
Distilled water to make up to (fl.)	10 ozs.	1,000 c.c.s.

Use equal parts of A and B mixed at time of developing.

Mawson X-Ray Plates.

A.—Metol	40 grs.	9 gms.
Hydroquinone	80 grs	18 gms.
Potass. metabisulphite .. .	80 grs.	18 gms.
Potass. bromide	10 grs	2 3 gms.
Dist. water to make	10 ozs.	1,000 c.c s.
B.—Sodium carbonate (cryst.) ..	800 grs.	180 gms.
Sodium sulphite	800 grs.	180 gms.
Dist. water to make	10 ozs.	1,000 c.c.s.

Equal parts of A and B.

Mawson Lantern Plates.

A negative of average density requires about 15 seconds at 1 foot from a No. 6 bat's-wing burner

Development begins rather slowly, especially with the hydroquinone formula, afterwards proceeding more rapidly.

Pyro-Ammonia Developer.

A.—Pyrogallic acid	20 grs.	4·5 gms.
Ammonium bromide	20 grs.	4·5 gms.
Potass. metabisulphite	50 grs.	11 5 gms.
Distilled water to make up to (fl)	10 ozs.	1,000 c.c.s
B —Liq. ammonia (0 880)	70 minims	15 c.c.s.
Distilled water to make up to (fl)	10 ozs.	1,000 c c.s.

Use equal parts of A and B mixed at time of developing.

Hydroquinone Developer.

A.—Hydroquinone	40 grs.	9 gms.
Potass. bromide	40 grs.	9 gms.
Potass. metabisulphite	40 grs.	9 gms.
Distilled water to make up to (fl)	10 ozs.	1,000 c.c.s.
B.—Caustic potash (sticks)	80 grs.	18 gms.
Distilled water to make up to (fl.)	10 ozs.	1,000 c.c.s.

Use equal parts of A and B mixed at time of developing.

Clearing Solution.

Hydrochloric acid	½ oz. (fl.)	50 c.c.s.
Saturated solution of alum, to..	10 ozs. (fl.)	1,000 c.c.s.

SULPHOCYANIDE TONING SOLUTION.

(For Blue-Black and Blue Tones.)

A.—Gold chloride	15 grs.	1 gm.
Distilled water to make up ..	7½ ozs. (fl.)	212 c.c.s.
B.—Ammonium sulphocyanide . ..	40 grs.	3 gms.
Distilled water to make up ..	4 ozs. (fl.)	113 c.c.s.

Use 1 part of A and 4 parts of B, mixed at time of using. This order of mixing must not be reversed.

SIMPLEX LANTERN PLATES.

Developer for Black Tones.

Amidol	100 grs.	20 gms.
Sodium sulphite	1000 grs.	200 gms.
Potass. bromide	5 grs.	1 gm.
Distilled water to make	10 ozs.	1000 c.c.s.

Use 1 part to 4 parts of water.

OZOBROME, LIMITED.

THE OZOBROME PROCESS.

Working Acid Bath.

Chrome alum, pure	180 grs.	15 gms.
Potass. bisulphate	60 grs.	5 gms.
Citric acid	25 grs.	2 gms.
Water	25 ozs.	1,000 c.c.s.

Dissolve in about half the total water (hot), and make up to the full bulk with cold. Use cold.

Pigmenting Bath.—A.

Concentrated Ozobrome solution (as sold) ..	1 part
Water	4 parts

Place the bromide print face upwards in cold water and sponge the surface to remove air bells. Immerse the pigment plaster in bath A until saturated (2 to 2½ minutes in winter, a rather shorter time in summer) and then transfer to B for 10 to 30 seconds (the shorter time for flat prints, longer for stronger). Less immersion in acid gives greater contrast. Drain the plaster for a few seconds and apply to the bromide in the dish of water, place on a flat support, and squeegee together with a flat squeegee. After 20 minutes' contact the plaster may be developed on the bleached bromide or transferred to another support.

BROMOIL (OIL-OZOBROME).

See under Bromoil, "Formulæ for the Photographic Processes" for the use of the Ozobrome solution.

THE OZOTYPE PROCESS.

Instructions for the Ozotype process were given in the "1907 Almanac," page 1047.

PAGET PRIZE PLATE COMPANY, LTD.

Paget Plates.

(*XXXXX*, "*Swift*," *XXX*, *and* "*Special Rapid*.")

PYRO-SODA.

No. 1.—Pyrogallic acid	.. .. ..	¼ oz.	25 gms.
Sulphuric acid	.. .. ..	5 minims	1 c.c.
Distilled water to make	.. ..	10 ozs.	1,000 c.c.s.
No. 2.—Carbonate of soda	.. ..	2 ozs.	200 gms.
Sulphite of soda	.. .. ..	2 ozs.	200 gms.
Distilled water to make	.. ..	10 ozs.	1,000 c.c.s.

For studio use, 1 part of each and 2 parts of water (making 4 parts altogether) will be found about right. Such developer contains about 3 grs. pyro and 22 grs. each of carbonate and sulphite to each oz. If more of No. 2 is used, it is well to add a little bromide for the purpose of preventing fog.

METOL-HYDROQUINONE.

Hydroquinone	.. .. ..	55 grs.	6 gms.
Metol	.. ..	14 grs.	1·5 gm.
Soda sulphite	.. .. ..	1 oz.	48 gms.
Soda carbonate	.. .. ..	1¼ oz.	60 gms.
Potass. bromide	.. .. ..	20 grs.	2·5 gms.
Water to make	.. .. ..	20 oz.	1,000 c.c.s.

Dissolve the sulphite in half the water, heated to about 150 deg., dissolve the hydroquinone in this and then add the metol, already dissolved in 20 times its weight of water. Dissolve the bromide and carbonate in about a quarter of the water, add this solution to the above and make the whole up to the required bulk with water

Paget P.O.P.

Toning.—The following bath is strongly recommended in preference to any other:—

Ammonium sulphocyanide	..	24 grs.	3·4 gms.
Gold chloride	.. .. ..	2 grs.	0·28 gm.
Water	.. ..	16 ozs.	1,000 c.c.s.

If it is desired to tone more slowly, a small quantity of sulphite of sodium, equal in quantity to the gold used, should be added to the

toning bath. This makes the bath work more slowly without making any other difference.

For decidedly *warm* tones (really pure light browns and red browns) the following formula is recommended :—

Gold chloride	1 gr.	0·15 gm.
Ammonium sulphocyanide ..	8 grs.	11·5 gms.
Sodium sulphite	1 gr.	0·15 gm.
Water to make	16 ozs.	1,000 c.c.s.

Tone to the desired colour, judging by looking through. Toning is slow, taking from 5 to 10 or 12 minutes. When toned, wash the prints in water, fix and finish as usual.

Developing.

The Paget "partial development" process is given under "Standard Formulæ for the Principal Photographic Processes."

Paget Collodion Papers.

COLLODIO-CHLORIDE P.O.P.

Gold Toning.

Ammonium sulphocyanide ..	30 grs.	2 gms.
Gold chloride	2 grs.	0·13 gm.
Water	16 ozs.	450 c.c.s.

PLATINOID C.C. PAPER.

A.—Gold chloride	15 grs.	2 gms.
Water	15 ozs.	1,000 c.c.s.
B.—Soda bicarbonate	120 grs.	16 gms.
Distilled water	15 ozs.	1,000 c.c.s.

For use, take 1 part A, 1 part B, and 28 parts water. The mixture does not keep; only enough for use should therefore be made up from A and B as required.

Tone prints to a chocolate or reddish purple colour. Wash for five minutes. Then tone again in—

Potass. chloroplatinite	15 grs.	0 5 gm.
Dilute phosphoric acid (Acid Phosph. dil B.P.)	3 ozs.	50 c.c.s.
Water to make	60 ozs.	1,000 c.c.s.

If a bluer black is desired it may be obtained by using ½ oz. of lactic acid in the second bath instead of 3 ozs. phosphoric acid.

The prints should remain in this bath until quite black. They are then washed and fixed as usual.

A very fine brown black may be obtained by the use of the chloroplatinite bath only. In this case the print should be placed, after first washing, in weak ammonia (say ½ oz. liquor ammonia 0·880 to the pint of water) for a few seconds, then washed again for a minute and toned.

Paget Self-Toning Papers.

COLLODION.

For warm brown tones wash print for 5 minutes and fix in—

Hypo	3 ozs.	150 gms.
Water	20 ozs.	1,000 c.c.s.

for 10 minutes; wash thoroughly and dry. If a colder tone be desired, *instead* of first washing, place print in—

Common salt	2 ozs.	100 gms.
Water	20 ozs.	1,000 c.c.s.

for 5 minutes, then rinse in water and fix as above.

Platinum Toning.

A fine olive black tone can be obtained in the following way—

Potassium chloroplatinite ..	15 grs.	1 gm.
Sodium chloride	150 grs.	10 gms.
Citric acid	150 grs.	10 gms.
Water to make	7½ ozs.	220 c.c.s.

For use, take 1 part of stock solution and 10 parts water.

The prints are first put into a bath of common salt 1 oz., water 10 ozs., for 5 minutes, washed, and then placed in the platinum bath and kept constantly moving, until all trace of red has disappeared from the print when it is looked through. This will take from 5 to 10 minutes. Wash again for 5 minutes and fix in the ordinary hypo fixing bath.

GELATINE ("SIMPLEX").

For coldest purple, fix in hypo,	8 ozs.	in 20 ozs., for	6 or 7 minutes.
" warmer " " "	8 to 4	" " "	" "
" sepia " " "	3 " 2	" " "	10 "
" brown or red " "	1½ " ½	" " "	15 "

Fixing should be timed fairly close to above directions, and bath should be about 65° F.

Paget Phosphate Paper.

DEVELOPER.

Stock Solutions.

A.—Metol	¼ oz.	5 gms.
Acetic acid, B.P.	3 ozs.	60 c.c.s.
Water, to make	20 ozs.	400 c.c.s.

In place of the B.P. (British Pharmacopœia) acid, 1 oz. of "glacial" acetic acid diluted with 2 oz. water may be used.

Working developer:—Stock solution, A. 1 part; water, 19 parts.

For redder tones and greater contrast, prepare:—

B.—Tartaric acid	¼ oz.
Water, to make	20 oz.

Developer:—A, 1 part; B, 1 part; water, 18 parts.

Developers may be used for two successive prints, not more. Time of development, from 1 to 3 minutes.

FIXING BATH.

Hypo	3 ozs.	150 gms.
Potass. metabisulphite	½ oz.	12·5 gms.
Water, to make	20 ozs.	1,000 c.c.s.

Fix for one minute, not longer.

Paget Bromide Papers.

Metol	8 grs.	9 gms.
Hydroquinone ..	30 grs.	3·4 gms.
Soda sulphite ..	¾ ozs.	37·5 gms.
Potass. bromide ..	2 grs.	0·23 gms.
Potass. carbonate ..	¾ oz.	37·5 gms.
Water to make ..	20 ozs.	1,000 c.c.s.

This developer is made up in the order directed for the metol-hydroquinone solution for Paget plates on an earlier page.

The image should appear very quickly, and development will be complete in about 2 to 3 minutes. Rinse in 3 changes of water and fix.

To produce softer results the developer may be diluted with an equal quantity of water, or the hydroquinone may be omitted or reduced.

"Gravura" (Gaslight) Papers.

FOR BLACK TONES, WITH NO. 1 OR NO. 2 PAPER.

Metol	1 oz.	6 gms.
Sodium sulphite	8 ozs.	48 gms.
Sodium carbonate (cryst.) ..	10 ozs.	60 gms.
Potass bromide	16 grs.	0·25 gm.
Water to make	160 ozs. (1 gallon)	1,000 c.c.s.

The above formula gives good gradation and an excellent black tone, but it *cannot* be used for colours. Development is complete in about 10 to 20 seconds.

For prevention of stress marks add to each ounce of developer at time of use about 15 minims of :—

Potass. cyanide	200 grs.	22 gms.
Water	20 ozs.	1,000 c.c.s.

WARM TONES, WITH NO. 2 PAPER ONLY.

H.—	Hydroquinone	1 oz.	55 grs.	6 gms.
	Metol	½ oz.	14 grs.	1·5 gm.
	Sodium sulphite	8 ozs.	1 oz.	48 gms.
	Sodium carbonate	10 ozs.	1¼ oz.	60 gms.
	Potass. bromide	16 grs.	2 grs.	0·25 gm.
	Water to make	160 ozs. (1 gallon)	20 ozs.	1,000 c.c.s.
A.C.—	Ammonium bromide		1 oz.	50 gms.
	Ammonium carbonate		1 oz.	50 gms.
	Water to make		20 ozs.	1,000 c.c.s.

Development for Colours.

Cool to Warm Sepias. Exposure—5 to 6 times Black.

Stock solution H.	1 oz.	30 c.c.s.
Stock solution A.C.	50—60 min.	3—3·5 c.c.s.
Water to make	6 oz.	170 c.c.s.

Warm Brown to Red. Exposure—6 to 8 times Black.

Stock solution H...	1 oz.	30 c.c.s.
Stock solution A.C.	¼ oz.	7 c.c.s.
Water to make	8 ozs.	230 c.c.s.

Red chalk. Exposure—8 to 10 times black.

Stock solution H...	1 oz.	30 c.c.s.
Stock solution A.C.	½ oz.	15 c.c.s.
Water to make ..	20 ozs.	570 c.c.s.

Red development may take 5 minutes or more.

Clearing Solution.

To remove friction marks and improve colour and clearness of prints.

No. 1.—Hypo	1 oz.	50 gms.
Water	20 ozs.	1,000 c.c.s.
No. 2.—Potass. ferricyanide	30 grs.	14 gms.
Water	5 ozs.	1,000 c.c.s.

For use, add ½ drachm of No. 2 to each ounce of No. 1, and lay the print in the mixture, in a clean dish. The marks can then be easily removed by gentle rubbing with a pad of cotton wool. Wash and dry the print as usual.

"Paget" Lantern Plates.

No. 1. -Hydroquinone	½ oz.	25 gms.
Sulphurous acid B P ..	¼ oz.	12·5 gms.
Potassium bromide ..	60 grs.	6·8 gms.
Water to..	20 ozs.	1,000 c.c.s.
No. 2.—Caustic soda ..	oz.	25 gms.
Sodium sulphite	½ ozs.	125 gms.
Water to.. ..	0 ozs.	1,000 c.c.s.

For Warm Tones.

No. 3.—Bromide of ammonium ..	1 oz.	50 gms.
Carbonate of ammonium ..	1 oz.	50 gms.
Water to..	20 ozs.	1,000 c.c.s

Carbonate of ammonium should be in clear lumps; if from exposure to the air it has become coated with the white powdery bicarbonate, the latter should be scraped off.

The following table shows how the developer should be used for black and warm tones:—

Relative Time of Exposure.	Constitution of Developer.	Time of Development.	Colour of Deposit.
30 secs. ..	No. 1 .. ½ oz. No. 2 .. ½ oz. Water to make 2 ozs.	2½ to 3 minutes.	Black
One minute ..	No. 1 .. ½ oz. No. 2 .. ½ oz. No. 3 ..100 minims Water to make 2 ozs.	5 minutes ..	Brown
One and a half minutes ..	No. 1 .. ½ oz. No. 2 .. ½ oz. No. 3 ..200 minims Water to make 2 ozs.	10 minutes..	Purple brown
Three minutes	No. 1 .. ½ oz. No. 2 .. ½ oz. No. 3 ..250 minims Water to make 2 ozs.	12 minutes..	Purple
Five minutes	No. 1 .. ½ oz. No. 2 .. ½ oz. No. 3 ..300 minims Water to make 2 ozs.	15 minutes.	Red

"Gravura" (Gaslight) Lantern Plates.

For black tones, these are developed with the second (H) formula given above for "Gravura" paper. For warm tones, in every case the water added should be only half the quantity mentioned.

RAJAR, LTD.

"Rajar" Plates.

Developer.

A.—Pyro	.. ..	½ oz.	25 gms.
Potass metabisulphite	.. ..	¼ oz.	12 5 gms.
Water	.. ..	40 ozs.	1.000 c.c.s.
B.—Soda sulphite	.. .. ..	4 ozs.	100 gms.
Soda carbonate	.. .. ..	4 ozs.	100 gms.
Potass bromide	.. .. ..	10 grs.	0·6 gm.
Water	.. ..	40 ozs.	1,000 c.c.s

Use equal parts of A and B.

"Rajar" Roll and Flat Films.

A.—Potass. metabisulphite	30 grs.	3·5 gms
Pyro..	½ oz.	12·5 gms.
Water	20 ozs.	1,000 c.c.s.
B.—Sodium carbonate	2 ozs.	100 gms.
Sodium sulphite	2 ozs.	100 gms.
Potass. bromide	10 grs.	1 gm.
Water	20 ozs.	1,000 c.c.s.

For correct exposure, A, 1 part; B, 1 part.
For under-exposure, A, 1 part; B, 2 parts; water, 1 part.
For over-exposure, A, 2 parts; B, 1 part, with 10 to 20 drops 10 per cent. potass. bromide solution per ounce of mixed developer.

"Rajar" P.O.P.

Toning Bath.

Ammonium sulphocyanide ..	20 grs.	1·6 gm.
Gold chloride	2 grs.	0·16 gm.
Water	30 ozs.	1,000 c.c.s.

This bath produces dark brown to purple black tones, but if warm tones are desired it is advisable to dilute the bath with the following solution:—

Sodium sulphite	2 grs.	0·23 gm.
Water	20 ozs.	1,000 c.c.s.

SEPIA TONES ON MATT PAPER

Stock Solutions.

A.—Potass. chloroplatinite	15 grs.	1 gm.
Water	15 ozs.	425 c.c.s.
Hydrochloric acid..	5 drops	5 drops

Mix the acid with the water and add the chloroplatinite.

B.—Citric acid..	400 grs.	45 gms.
Common salt	400 grs.	45 gms.
Water	20 ozs.	1,000 c.c.s.

Toning bath:—A, 1 oz.; B, ½ oz.; water, 15 ozs.

"Rajar" C.C. Paper.

Wash and tone in—

Ammonium sulphocyanide	21 grs.	1·4 gm.
Gold chloride	4 grs.	0·26 gm.
Water	25 ozs.	710 c.c.s.

Matt Paper.

Print till shadows bronze, wash and tone in—

Sodium acetate	100 grs.	11·4 gms.
Gold chloride	2½ grs.	0·28 gm.
Water	20 ozs.	1,000 c.c.s.

again washing and toning in—

Citric acid	150 grs.	17·1 gms.
Potass. chloroplatinite	10 grs.	1·1 gm.
Water	20 ozs.	1,000 c.c.s.

"Rajar" Self-toning P.O.P.

When printed fix in the baths described below, then wash for an hour in water

Depth of Printing.	Fixing bath. To the pint water.	Time.	Tone.
Very dark (shadows blocked)	6 ozs. hypo.	6 minutes	Purple.
Fairly deep	3 ozs. hypo.	10 minutes	Sepia.
Usual depth..	2 ozs. hypo.	10 minutes	Brown.
	1 oz. hypo.	15 minutes	Red brown.

For black and olive-black tones (on the matt paper only) print rather darkly and place in :—

Common salt	1 oz.	50 gms.
Water	20 ozs	1,000 c.c.s.

for five minutes, and then tone in the platinum bath given above for sepia tones on matt P.O.P.

"Rajar" Bromide Paper.

Developer.

Metol .. .	8 grs.	0 9 gm.
Hydroquinone .	30 grs.	3·5 gms.
Sodium sulphite .	¾ oz.	37 5 gms.
Sodium carbonate	¾ oz.	37 5 gms.
Potass. bromide .	20 grs.	2·3 gms.
Water .. .	20 ozs.	1,000 c.c.s.

"Rajar" Gaslight Papers.

Developer for Black Tones on Ordinary and "Varecolor."

Metol	16 grs.	1·8 gms.
Hydroquinone	60 grs.	6·8 gms.
Sodium sulphite	480 grs.	55 gms.
Sodium carbonate	800 grs.	91 gms.
Potass bromide	2 grs.	0·2 gm.
Water	20 ozs.	1,000 c.c.s.

Warm Tones Developer, D, on "Varecolor."

Water	20 ozs.	1,000 c.c.s.
Soda sulphite	2½ ozs.	125 gms.
Soda carbonate	5 ozs.	250 gms.
Hydroquinone	150 grs	17 gms.
Potass. bromide	100 grs.	11 4 gms.

Tone required.	Exposures. Times for Black Tone.	Developer.
Green-black	same	D, solution
Sepia	2	D 1 oz ; water, 3 ozs.
Brown	4	D, 1 oz. ; water, 10 ozs.
Red chalk	6	D, 1 oz. ; water, 20 ozs.

ROTARY PHOTOGRAPHIC CO., LTD.

"Rotograph" Negative Paper.

A.	Ortol	1 oz.	16·5 gms.
	Potass. metabisulphite	½ oz.	8·2 gms.
	Water	60 ozs.	1,000 c.c.s.
B.	Sodium carbonate	12 ozs.	200 gms.
	Sodium sulphite	8 ozs.	130 gms.
	Water	60 ozs.	1,000 c.c.s.

For use take A, 1 part; B, 1 part; water to make 10 parts.

This developer is most suitable when working from harsh transparencies since, like amidol, it tends to softness.

The paper should be fixed in an "acid" bath.

When dry, it is sufficiently transparent to print quickly without further treatment. If, however, great transparency is required, the following mixture should be rubbed into the back of the paper with cotton wool.

Canada balsam	1 oz.
Turpentine	5 ozs.

"Roto" P.O.P.

A.	Ammonium sulphocyanide	1 oz.	100 gms
	Water to make	10 ozs.	1,000 c.c.s.
B.	Gold chloride	15 grs.	1 gm.
	Water	15 drs.	53 c.c s.

For purple tones, A, 3 drs.; water, 20 ozs.; B, 1½ dr. For warm brown tones, A, 2 drs.; sodium sulphite, 1 gr.; water, 20 ozs.: B, 1 dr.

For Matt P.O.P.

Sodium acetate	60 grs.	4 gms.
Borax	80 grs.	5·2 gms.
Gold chloride	2 grs.	0·13 gm.
Water to make	35 ozs.	1,000 c.c.s.

"Rotary" Collodio-Chloride P.O.P.

Toning Baths for the Matt Paper.

Sodium acetate	96 grs.	2 gms.
Chloride of gold	2½ grs.	5 c.c.s. of 1% solution.
Distilled water	20 ozs.	200 c.c.s.

Make this bath up several hours before use.

The prints should be toned in this bath only until they commence

to change colour. Then wash thoroughly for a few minutes and place in—

Potassium chloroplatinite	..	12 grs.	1 gm.
Citric acid, pure ..	.. ..	180 grs.	15 gms.
Distilled water ..	.. ..	20 ozs.	800 c.c.s.

Make this bath up about an hour before use.

The prints should remain till the desired tone is attained. The tone passes from red to brown, brownish-black, blue-black to pure black.

Very fine warm and permanent tones, somewhat similar to platinum prints, may be obtained merely by use of the above platinum bath, without the preliminary gold bath.

Red, sepia, and violet tones can be obtained by short or long toning with the gold bath alone.

Toning Bath for the Glossy Paper.

After washing, the prints should be immersed in the following toning bath :—

Sodium acetate (fused) ..	..	530 grs.	5·5 gms.
Ammonium sulphocyanide	..	48 grs.	0·5 gm.
Distilled water ..	.. ..	20 ozs.	100 c.c.s.
Chloride of gold ..	.. ..	$\frac{1}{2}$–$\frac{3}{4}$ gr.	6 to 8 c.c.s. of 1% solution.

Make this bath up several hours before use.

Tone to any point the finished prints are required to be, wash, fix and wash.

"Rotona" P.O.P.

For warm tones, fix for 10 minutes in hypo, 5 ozs. ; water, 20 ozs., adding a little bicarbonate of soda.

For warmer tones, wash first in 2 or 3 changes of water or use a weaker hypo bath for a longer time.

For blue and purple tones, fix in stronger hypo (up to 8 ozs. in 20 ozs. water) ; or treat first for 3 to 5 minutes in salt (2 ozs. in 20 ozs.), afterwards fixing in hypo, 4 ozs. ; water, 20 ozs.

"Rotograph" Bromide Papers.

Metol-Hydroquinone Developer.

Metol ..	.. .. ..	50 grs.	5·7 gms.
Hydroquinone ..	.. ..	40 grs.	4·6 gms.
Sodium sulphite ..	.. ..	500 grs.	57 gms.
Potass. bromide ..	.. ..	25 grs.	2·9 gms.
Sodium carbonate	.. ..	500 grs.	57 gms.
Water (distilled or boiled) to	..	20 ozs.	1,000 c.c.s.

Amidol Developer.

Sodium sulphite ..	.. ..	200 grs.	23 gms.
Potass. bromide ..	.. ..	1 gr.	0·1 gm.
Amidol ..	.. .. ..	20 grs.	0·7 gm.
Water to ..	.. .. ..	6 ozs.	1000 c.c.s.

Dilute 1 part of the above with 4 parts of water, and apply to the paper; as soon as the shadows have developed pour off, and apply the strong solution till sufficient density is obtained; then pour off, wash well, and fix. This method gives rich blacks with brilliant whites.

"Rotox" (Gaslight) Paper.

Rodinal Developer.

Rodinal	1 oz.	50 c.c.s.
Water	20 ozs.	1.000 c.c.s.

Add a few drops 10% bromide solution as required.

Metol-Hydroquinone.

Sodium carbonate	2½ ozs.	125 gms.
Sodium sulphite	1 oz.	50 gms.
Metol	16 grs.	1·8 gm.
Hydroquinone	55 grs.	6·3 gms.
Potass. bromide	3 grs.	0·35 gm.
Water	20 ozs.	1,000 c.c.s.

Development takes place very quickly. If correctly exposed, the print attains full density in 5 to 10 seconds.

W. W. ROUCH AND CO.

Developer Stock Solutions.

A.—Pyro	1 oz.	100 gms.
Sodium sulphite	4 ozs.	400 gms.
Water to make	10 ozs.	1,000 c.c.s.

Dissolve the sulphite of soda in hot water, and, when cold, add the pyrogallic acid.

B.—Ammonium bromide	1 oz.	100 gms.
Water to make	10 ozs.	1,000 c.c.s.
C.—Liquor ammonia (880)	3 ozs	300 c.c.s.
Water to make	10 ozs.	1,000 c.c.s.

SCHLEUSSNER & CO.

Paragon "Fine Grain," "Special Rapid," and "Extra Rapid" Plates.

Developer.

A.—Metol	90 grs.
Soda sulphite (cryst.)	2 ozs.
Potass. bromide	10 grs.
Water	20 ozs.

Dissolve the metol first

B.—Soda carbonate (cryst.)	2 ozs.
Water	20 ozs.

For normal exposures, mix equal parts of A and B.

With correct exposure, the image appears quickly: it is thin and flat at first, but steadily gains in vigour.

For over-exposures use:—A, 2 parts; B, 1 part.

Ultra-Rapid Plates.

Developer.

A.—Potass. metabisulphite	.. ..	45 grs.
Pyro	.. ..	180 grs.
Water	.. ..	20 ozs.
B.—Soda sulphite (cryst.)	.. ..	3 ozs.
Soda carbonate (cryst.)	.. ..	2 ozs.
Potass. bromide	.. ..	5 grs.
Water	.. ..	20 ozs.

For normal exposures, mix equal parts of A and B.

In case of under-exposure, use less of A and more of B, that is a developer weaker in pyro and stronger in alkali

For over-exposure, take more of A to less of B. Remember that A gives vigour, B, detail. Increase of A (over and above the half-measure) tends to density and brilliance: *decrease* of B (below the half-measure) to softness. For very soft results, make up the developer with 1 part A, 1 part B, and 1 part water.

The metol developer, given above, is also excellent for the "Ultra-rapid" plates.

"Ortho" and "Non-Screen" Plates.

Developer.

Potass. metabisulphite	.. ..	$2\frac{1}{2}$ ozs.
Glycin	.. ..	$1\frac{1}{4}$ oz.
Potass. carbonate	.. ..	10 ozs.
Water	.. ..	9 ozs.

Mix the metabisulphite and glycin together in a large mortar or basin. Add the potass. carbonate and then the water in small doses, stirring the mixture all the time. This makes the so-called "Glycin Paste," a white cream which keeps indefinitely in well-corked bottles. To make the developer, mix 1 part (after well shaking) with 12 to 15 parts of water. If used as a stand developer, this solution is further mixed with 4 to 6 times its own bulk of water.

WARWICK DRY PLATE CO.

(*"Special Rapid," "Double Instantaneous," 'Rainbow," and "Warpness" plates.*)

A.—Pyro	.. ..	1 oz.	12·5 gms.
Nitric acid	.. ..	20 drops	10 drops.
Water	.. ..	80 ozs	1,000 c.c.s.
B.—Soda sulphite	.. .. ..	10 ozs.	112 5 gms.
Soda carbonate, crystal	.. ..	9 ozs.	125 gms.
Water	.. ..	80 ozs.	1,000 c.c.s.

For correct exposure, use equal parts of A and B. For under exposure, use more B. For over-exposure, use more A, or add a few drops of 10 per cent. potass. bromide solution. For correct exposure, no bromide is necessary.

HYDROQUINONE.

No. 1.—Water	.. ..	20 ozs.	1,000 c.c.s.
Hydroquinone	.. .. ..	120 grs.	14 gms.
Sodium sulphite	.. .. ..	2 ozs.	100 gms.
No. 2.—Water	.. ..	20 ozs.	1,000 c.c.s.
Potass. carbonate	.. .. ..	4 oz.	200 gms.
Potass. bromide	.. .. ..	30 grs.	3·5 gms.

For use take equal parts of each.

Half the hydroquinone may be replaced by metol, and developer is then as rapid as pyro-soda, though it will not allow quite so much latitude in exposure.

WELLINGTON AND WARD.

Wellington Plates.

(" *Speedy*," " *Iso Speedy*," *and* " *Landscape*.")

Pyro-Ammonia Developer.

No. 1.—Pyrogallic acid	.. .. ..	1 oz.	100 gms.
Sodium sulphite	.. .. ..	2 ozs.	200 gms.
Citric acid	.. ..	40 grs.	9·2 gms.
Water to	.. ..	10 ozs.	1,000 c.c.s.
No. 2.—Ammonia (0·880)	.. ..	1 oz.	100 c.c.s.
Water to	.. ..	10 ozs.	1,000 c.c.s.
No. 3.—Ammonium bromide	.. ..	1 oz.	100 gms.
Water to	.. ..	10 ozs.	1,000 c.c.s.

Take 10 minims (2 c.c.s.) of No. 1, 10 minims of No. 2, and 5 minims (1 c.c.) of No. 3 to each ounce (100 c.c.s.) of water.

Pyro-Soda Developer.

No. 1.—Pyrogallic acid	.. .. ..	1 oz.	100 gms.
Sodium sulphite	.. .. ..	2 ozs.	200 gms.
Citric acid	.. ..	40 grs.	9·2 gms.
Water to	.. ..	10 ozs.	1,000 c.c.s.
No. 2.—Sodium carbonate	.. ..	8 ozs.	100 gms.
Sodium sulphite	.. .. ..	8 ozs.	100 gms.
Water to	.. ..	80 ozs.	1,000 c.c.s.

Normal Work. Take 1 [illegible] of No. 2 and 1 dr. of No. 1, with water 1 oz.

Studio Work.—Take 1 oz. of No. 2 and ½ dr. of No. 1, with water 1 oz.

" PRESS " PLATE.

Metol Hydroquinone Developer.

A.—Water	.. ..	40 ozs.	1,000 c.c.s.
Metol	.. ..	70 grs.	4 gms.
Hydroquinone	.. .. ..	100 grs.	5·7 gms.
Soda sulphite	.. .. ..	4 ozs.	100 gms.
B.—Water	.. ..	40 ozs.	1,000 c.c.s.
Soda carbonate	.. .. ..	6 ozs.	150 gms.

Equal parts of A and B.

WELLINGTON "ORTHO PROCESS" PLATES.

Hydroquinone Developer.

Hydroquinone	80 grs.	9·1 gms.
Sodium sulphite	1 oz.	50 gms.
Potass. hydrate	80 grs.	9·1 gms.
Ammonium bromide	10 grs.	1·1 gm.
Water	20 ozs.	1,000 c.c.s.

Pyro-Soda.

No. 1.—Pyrogallic acid	1 oz.	100 gms.
Sodium sulphite	2 ozs.	200 gms.
Citric acid	40 grs.	9·1 gms.
Water to	10 ozs.	1,000 c.c.s.
No. 2.—Sodium carbonate	8 ozs.	100 gms.
Sodium sulphite	8 ozs.	100 gms.
Potass. bromide	40 grs.	1·1 gm.
Water to..	80 ozs.	1,000 c.c.s.

No. 1, 1 dr.; No. 2, 1 oz.

"WELLINGTON" ROLL-FILMS.

The pyro-soda developer for "Speedy" plates is used for the films using—No. 1, 1 drachm; No. 2, 1 oz.; water, 1 oz.

For over-exposed negatives, add 10 to 20 drops of 10% bromide solution per 4 ozs. of developer.

WELLINGTON "WATALU" PLATES.

(Self-developing.)

"DEVELOPER."

For a quarter-plate	1 oz. of water
For a half-plate	2 ozs. of water
For a whole-plate	4 ozs. of water

For normal exposure it is best to have the water at a temperature of 60 deg. Fahr. Gently rock the dish for the first minute or two, in order to assist the soluble backing to dissolve.

For under-exposure add three to four times the original quantity of water, raise the temperature of same to 70 deg. Fahr., and continue development for 15 minutes.

"Wellington" P.O.P.

ORDINARY.

Formate Toning Bath.

Sodium formate	15 grs.	0·85 gm.
Sodium bicarbonate	3 grs.	0·17 gm.
Gold chloride	2 grs.	0·11 gm.
Water (distilled)	40 ozs.	1,000 c.c.s.

The bath is ready for use as soon as made up; it will not keep.

Phosphate Toning Bath.

Phosphate of soda	60 grs.	3·4 gms.
Gold chloride	2 grs.	0·11 gm.
Water	40 ozs.	1,000 c.c.s.

This bath should be allowed to stand one hour before using; it will not keep. The above quantity is sufficient for 24 half-plates.

"WELLINGTON" SPECIAL AND "CARBON" P.O.P.

Well wash the prints previous to immersion in the toning bath.

Ammonium sulphocyanide ..	20 grs.	2·8 gms.
Gold chloride	2 grs.	0·3 gm.
Water	16 ozs.	1,000 c.c.s.

The tone is to be entirely judged by the surface, and not by looking through the print. Always undertone, as the finished print becomes very much colder when dry.

"Wellington" Self-Toning Paper.

Immerse prints direct, without washing, in the following :—

Hyposulphite of soda	6 ozs.	300 gms.
Water	20 ozs.	1,000 c.c.s.

The fixing bath should be rendered alkaline by the addition of 30 grains (3·5 gms.) of bicarbonate of soda, which prevents sulphur toning and ensures greater permanency of the print.

Fix until desired tone is reached, which should not be less than eight minutes; then wash thoroughly.

"Wellington" Bromide Papers.

Amidol is recommended as the most reliable developer for general purposes, although any other may be used.

Amidol	50 grs.	5·7 gms.
Soda sulphite	650 grs.	74 gms.
Potass. bromide	10 grs.	1·1 gm.
Water	20 ozs.	1,000 c.c.s.

This developer should be used within three days of mixing.

It is often recommended to keep a stock solution of sodium sulphite by itself, and to take some of this when wanted and add the amidol to it. *Experience shows that this will not do,* as amidol when used with stale sulphite solution develops very slowly, and there is a great loss of brilliancy in the resulting prints. The developer given above should therefore be mixed up as directed, and used within three days of mixing.

Metol-Hydroquinone Developer.

Metol	50 grs.	6 gms.
Hydroquinone	15 grs.	1·7 gm.
Sulphite of soda	500 grs.	57 gms.
Potass. bromide	10 grs.	1·1 gm.
Potass. carbonate..	100 grs.	11 gms.
Water	20 ozs.	1,000 c.c.s.

Dissolve the metol in the water first.

CLEARING AND REDUCING BROMIDE PRINTS.

In clearing up and brightening up a bromide print, removing surface markings or yellow stains or slight fog, the following bath will be found of great service. It should be applied after fixing and washing,

the prints being left in until the desired clearing has taken place, and then removed and well washed.—

Thiocarbamide	20 grs.	4·6 gms.
Citric acid	10 grs.	2·3 gms.
Water	10 ozs.	1,000 c.c.s.

This bath will not work unless all traces of hypo have been removed from the print.

BRIGHT PRINTS FROM VERY WEAK NEGATIVES.

The following method will be found to give bright vigorous prints from flat negatives when every other means has failed :—

Expose the bromide paper in the usual way, developing it as long as any increase in depth is seen to be gained, ignoring altogether the discolouration of the high-lights—over-develop it, in fact. After fixing and washing, pour over it the following reducing solution until it is seen to be considerably lighter; when it is, at once plunge into clean hypo for a few minutes. If it is not yet light enough it may be again washed, treated with reducer, and fixed. When it is seen that any further reduction will render the blacks grey, it is washed and dried. Many a negative otherwise quite useless may in this way be saved :—

Potassium iodide	30 grs.	6·8 gms.
Water	10 ozs.	1,000 c.c.s.
Iodine	3 grs.	0·7 gm.

With this bath the whites of the print will assume a dark blue tint, owing to the formation of iodide of starch due to the sizing of the paper; this immediately vanishes upon placing in the hypo solution.

"Wellington" S.C P.

Slow Contact Paper.

Metol	10 grs.	2·3 gms.
Hydroquinone	30 grs.	6·8 gms.
Sulphite of soda (cryst.)	350 grs.	80 gms.
Carbonate of soda (cryst.) ..	350 grs.	80 gms.
Bromide of potassium	3 grs.	0·7 gm.
Water	10 ozs.	1,000 c.c.s.

Dissolve the above in the order named.

For very brilliant blue-black tones a suitable developer is :—

Sulphite of soda	500 grs.	114 gms.
Amidol	50 grs.	11·4 gms.
Bromide of potassium	2 grs.	0·46 gm.
Water	10 ozs.	1,000 c.c.s.

This developer keeps only three days; after that time it should be discarded and fresh made up.

"Wellington" Lantern Plates.

For Cold Tones.

The single-solution hydroquinone developer given above for Wellington "Ortho-Process" plates is used, using, however, potass. bromide in place of ammonium bromide.

Developer for Warm Black Tones.

Three stock solutions of pyro, ammonia and bromide are prepared as given above for "Speedy" plates. These are used as follows:—Take 30 minims of No. 1, 60 minims of No. 2, and 30 minims of No. 3, with water, 1 oz. This is for warm black tones. Time of development, two minutes.

For warmer tones, increase the exposure four to six times, also increasing No. 3 up to 90 minims. Time of development, five to six minutes.

"WELLINGTON" S.C.P. LANTERN PLATES.

Developer.

A.—Metol	..	20 grs.	2·3 gms.
Sodium sulphite	..	200 grs.	23 gms.
Sodium carbonate	..	800 grs.	91 gms.
Hydroquinone	..	20 grs.	2·3 gms.
Potass. bromide	..	20 grs.	2·3 gms.
Water	..	20 ozs.	1,000 c.c.s.

Increase of the bromide up to 20 grs. per ounce of developer gives very pleasing warm tones.

Warm Brown to Sepia Tones.

B.—Ammonium carbonate	..	1 oz.	10 gms.
Ammonium bromide	..	1 oz.	10 gms.
Water	..	10 grs.	100 c.c.s.

For warm brown to sepia tones, take A, 1 oz. · B, 1 drachm.
For very warm reddish tones, take A, 1 oz.; B, 2 drachms.

WRATTEN & WAINWRIGHT, LTD.

Wratten Plates.

TEN PER CENT. PYRO AND AMMONIA.

A.—Liquor ammonia	..	1 oz.	100 c.c.s.
Potass. bromide	..	100 grs.	21 gms.
Water	..	10 ozs.	1,000 c.c.s.
B.—Pyro	..	1 oz.	100 gms.
Citric acid	..	60 grs.	12 gms.
Or—			
Sulphuric acid	..	½ dr.	6 c.c.s.
Water	..	10 ozs.	1,000 c.c.s.

For use with "I.D.S." and "Speed" Plates, the bromide in solution A should read—

Potass. bromide	..	110 grs.	22 gms.

For instantaneous and ordinary take from 60 (3 c.c.s.) to 90 minims (5 c.c.s.), and for "I.D.S." and "Speed" plates 90 minims (5 c.c.s.) of solution B, dilute with from 2 to 4 ozs. (60 to 120 c.c.s.) of water, and add 100 minims (6 c.c.s.) of solution A.

It is better to add solution A by instalments as development proceeds, unless the exposure is known to be either insufficient or quite accurate, in which cases it may be in one quantity.

PYRO-SODA.

We recommend this developer for studio and hand camera work.

No. 1.—Sodium sulphite	6 ozs.	75 gms.
Water	80 ozs.	1,000 c.c.s.
Sulphuric acid	1 dr.	1·5 c.c.
Pyro	1 oz.	13 gms.
No. 2.—Sodium carbonate	6 ozs.	75 gms.
Water	80 ozs.	1,000 c.c.s.

For use, take equal parts of Nos. 1 and 2.

For denser negatives use the following more concentrated developer :—

No. 3.—Sodium sulphite	6 ozs.	100 gms.
Water	60 ozs.	1,000 c.c.s.
Sulphuric acid	1 dr.	2 c.c.s.
Pyro	1 oz.	17 gms.
No. 4.—Sodium carbonate	6 ozs.	100 gms.
Water	60 ozs.	1,000 c.c.s.

Take equal parts of Nos. 3 and 4.

For "Verichrome," "Allochrome,' Wratten Panchromatic," and Bathed" Plates

Metol	44 grs.	10 gms.
Hydroquinone	22 grs.	5 gms.
Sodium sulphite	1 oz.	100 gms.
Sodium carbonate	1 oz.	100 gms.
Water	60 ozs.	6,000 c.c.s.

For Process and X Ray Plates.

A.—Hydroquinone	1 oz.	25 gms.
Potass. metabisulphite	1 oz.	25 gms.
Potass. bromide	1 oz.	25 gms.
Water	40 ozs.	1,000 c.c.s.
B.—Caustic potash, pure	2 ozs.	50 gms.
Water	40 ozs.	1,000 c.c.s.

Use equal parts of A and B, and develop for three minutes.

Wratten Lantern Plates.

(BROMIDE EMULSION.)

Developer.

A.—Metol-hydroquinone, single solution, given above for "Verichrome" plates.

B.—Ammonium bromide	1 oz.	100 gms.
Ammonium carbonate	1 oz.	100 gms.
Water	10 ozs.	1,000 c.c.s.
C.—Hypo	1 oz.	100 gms.
Water	10 ozs.	1,000 c.c.s.

Develop as follows :—Give the exposure and mix the developer according to the colour required.

Measure the time from the pouring on of the developer to the appearance of the image. Multiply that time by 8 and develop for the total time thus found.

Tone.	Developer. (1 oz. contains) Drs.	Drs.	Drs.	Exposure Multiple.	Development time (in mins.) at 60° F.
Warm black ..	7½ A	½ B		2	2½
Cool sepia ..	7 A	1 B		3	4
Warm sepia ..	6½ A	1½ B		3½	8
Sepia brown ..	6 A	2 B		6	10
Brown ..	6½ A	½ B	1 C	3	5
Brown purple	6 A	1 B	1 C	5	10
Purple ..	5½ A	2 B	½ C	10	12
Carmine ..	4½ A	3 B	½ C	48	20

Thiocarbamide Developer.

T.—Thiocarbamide	.. .. ..	66 grs.	7·5 gms.
Ammonium bromide	.. ..	22 grs.	2·5 gms.
Water	.. ..	20 ozs.	1,000 c.c s.

The following table gives the exposure and developing factors for the production of blue tones with thiocarbamide.

Tone.	Developer.	Exposure Multiple.
Dead black (Neutral)	7 A + ½B + ½T	2
Blue black	6 A + 1½B + ½T	4
Blue	5½A + 2 B + ½T	8
Violet	5 A + 2½B + ½T	16

The time of development with thiocarbamide depends so greatly on the temperature that visual inspection is necessary. Neither time nor factorial methods are of any use.

CHAS. ZIMMERMANN & CO., LTD.

"Agfa" Plates.

ISOLAR.

Rodinal Developer.

In cases of normal exposure develop with—

Rodinal	1 part
Water	20 parts

In cases of over-exposure with—

Rodinal	1 part
Water	10 parts

(adding an ample quantity of solution of potassium bromide, 1: 10), and in case of under-exposure use—

Rodinal	1 part
Water	30—40 parts

If development has been performed with an alkaline developer, such as rodinal, eikonogen, metol, pyro, etc., the negative will be quite

clear after fixing; but should ferrous oxalate or amidol have been used, there will in all probability be a red colouring of the gelatine, in which case, after fixing, give the plate a five minutes' wash and transfer to a bath of soda carb. 10 per cent. for seven minutes, wash again and replace in the acid fixing bath for ten minutes, and then wash as usual.

When being subsequently intensified or reduced the red colour may reappear, especially when mercury intensification is being employed. In such a case immerse the plate in a 10 per cent. soda carb. solution for 10 minutes, and then wash until the colour has gone (about one hour).

CHROMO PLATES.

Metol-Hydroquinone Developer.

Metol	48 grs.	5 gms.
Hydroquinone	72 grs.	7·5 gms.
Soda sulphite	2 ozs.	100 gms.
Potass. carbonate	192 grs.	20 gms.
Potass. bromide	10 grs.	1 gm.
Water	20 ozs.	1,000 c.c.s.

For softer negatives use rodinal, 1 in 20.

"Crossed Swords" P.O.P.

For Carbon Red Tones.

Water	19 ozs.	1,000 c.c.s.
Borax	41 grs.	5 gms.
Chloride of gold	1 gr.	0·12 gm.

Must be made up two hours before use, but does not keep well.

Print to about required colour, not too deeply, wash in three changes of water, immerse in :—water 20 ozs., salt 2 drams, until the print has turned orange yellow. Wash once and then tone. When a very slightly lighter colour than desired is obtained, replace in the salt solution for five minutes, rinse and fix in :—hypo 2 ozs., water 40 ozs., freshly made.

Carbon Purple and Violet Tones.

Water	9 ozs.	250 c.c.s.
Hydrochloric acid..	3 ozs.	85 c.c.s.
Gold chloride	3 grs.	0·2 gm.

Print very deeply, wash thoroughly, and tone until desired colour is reached. Wash again and fix in :—hypo 2 ozs., water 40 ozs.

Less acid gives bluish violet. More acid gives red violet—purple.

Toning may be stopped at any stage.

Black Tones.

Wash prints in four changes of water before toning and place in :—

Potass. chloroplatinite	15 grs.	1 gm.
Phosphoric acid (P.B. dil.) ..	5 drs.	18 c.c.s.
Distilled water	35 ozs.	1,000 c.c.s.

When the pictures have assumed the desired black tone they are to be fixed in 5 per cent. hypo for ten minutes, and washed for half an

hour in running water. These prints must not be washed (before toning) in the same bath as any other paper, and when removed from the final washing water should be blotted off.

Matt-Albumat.

Gold, Platinum, and Gold-Platinum Toning.

Sodium acetate	22 grs.	2·5 gms.
Soda carbonate	4½ grs.	0·5 gm.
Gold chloride	1 gr.	0 11 gm.
Water	20 ozs.	1,000 c.c.s.

For platinum black tones, tone for about 30 secs. in the above bath, wash well and transfer to the following platinum bath:—

Potass. chloroplatinite	15 grs.	1 gm.
Oxalic acid	150 grs.	9·7 gms.
Hydrochloric acid..	84 minims	5 c c s.
Water	36 ozs.	1,000 c.c.s.

in which the prints must be toned until they have quite a mauvish tint by transmitted light. Used alone, after washing, gives range of tones from brown to black. Best used fresh.

For gold-platinum tones, prints are placed in gold bath for one second only, quickly washed and placed in platinum bath.

For warm black tones, after the first washing immerse the prints one by one in the platinum bath.

For red tones, wash very thoroughly after printing, and then place the prints in a solution of—

Common salt	1 oz
Water	20 ozs.

Wash well, and dip for a few seconds only in the platinum bath, and then fix as instructed.

For brown or sepia tones as above, leave the prints somewhat longer in the platinum bath.

"Agfa" Isolar Lantern Plates.

Rodinal Developer.

Rodinal	1 part
Water	30 - 40 parts

Fix in an acid fixing bath.

The fixed picture will usually be found to have a slight coloration, which must be removed by the following operation:—Thoroughly rinse the plate after fixing, and immerse in soda carbonate 10 per cent. solution for five minutes. The colour will increase in this bath, but disappear entirely after a further wash and immersion in the acid fixing bath, after which wash as usual and then dry.

MISCELLANEOUS INFORMATION.

List of the Principal Works on Photography.

[The books mentioned below are obtainable by order of all photographic dealers.]

ELEMENTARY AND GENERAL TEXT-BOOKS.

Elementary Photography. By John A. Hodges. 1*s.*
Ilford Manual of Photography. By C. H. Bothamley. 1*s.*
Sinclair Handbook of Photography. 1s.
Barnet Book of Photography. 1s. 6*d.*
Early Work in Photography. By W. Ethelbert Henry. 1*s.*
Hand-Camera Photography. By Walter Kilbey. 1*s.*
Photography in a Nutshell. By the Kernel. 1*s.*
Photographic Reference Book By J. McIntosh. 1*s.* 6*d.*
The Science and Practice of Photography. By Chapman Jones. 5*s.*
Instruction in Photography. By Sir William Abney. 11th Edition. Revised and enlarged. 7*s.* 6*d.*
Dictionary of Photography. By E. J. Wall. 7*s.* 6*d.*
The Complete Photographer. By R. Child Bayley. 10*s.* 6*d.*
Photography: Its History, Processes, Apparatus and Materials. By A. Brothers. 21*s.*
The Book of Photography. By Paul N. Hasluck. 10*s.* 6*d.*
Photography in Principle and Practice. By S. E. Bottomley. 3*s.* 6*d.*

PHOTOGRAPHIC OPTICS AND CHEMISTRY.

Photographic Lenses: How to Choose and How to Use. By John A. Hodges. 2*s.*
Photographic Lenses. By Conrad Beck and Herbert Andrews. 1*s.*
The Lens. By Thos. Bolas and George E. Brown. 2*s.* 6*d.*
The Optics of Photography and Photographic Lenses. By J. Traill Taylor. 3*s.* 6*d.*
System of Applied Optics. By H. Dennis Taylor. 30*s.*
Photographic Optics, a Treatise on. By R. S. Cole. 6*s.*
Photographic Optics. By Otto Lummer. Translated by Silvanus Thompson. 6*s.*
First Book of the Lens. By C. Welborne Piper. 2*s.* 6*d.*
Telephotography. By T. R. Dallmeyer. 21*s.*
Modern Telephotography. By Captain Owen Wheeler. 1*s.* 6*d.*
Practical Telephotography. (No. 90 of "The Photo-Miniature.")
Lens work for Amateurs. By Henry Orford. 3*s.*
Tables of Conjugate Foci. By J. R. Gotz. 6*d.*

Chemistry for Photographers. By Charles F. Townsend, F.C.S. 1s.
The Chemistry of Photography. By R. Meldola. 6s.
Investigations on the Photographic Processes. By S. E. Sheppard, D.Sc., and C. E. Kenneth Mees, D.Sc. 6s. 6d.

ART, PORTRAITURE, HAND-CAMERA WORK, ETC.

Picture-making by Photography By H. P. Robinson. 2s. 6d.
Photography on Tour. 6d.
Correct Exposure. (No. 105 of "The Photo-Miniature.")
Practical Landscape Photography. By G. T. Harris. 1s.
The Photographic Studio. A guide to its construction, etc. By T. Bolas. 2s.
The Lighting in Photographic Studios. By P. C. Duchochois. Revised, with additional matter, by W. Ethelbert Henry, C.E. 1s.
Magnesium Light Photography. By F. J. Mortimer. 1s.
Hand-Camera Work. (No. 107 of "The Photo-Miniature.")
Reflex Cameras. (No. 99 of "The Photo-Miniature.")
Instantaneous Photography. By Sir William Abney. 1s.
Copying Methods. (No. 41 of "The Photo-Miniature.")
Panoramic Photography. (No. 73 of "The Photo-Miniature.")
Stereoscope and Stereoscopic Photography. From the French of F. Drouin. 2s.
Stereoscopic Photography. (No. 98 of "The Photo-Miniature.")
Photo-micrography. By E. J. Spitta. 12s.
Practical Photo-micrography. By Andrew Pringle. 3s. 6d.

NEGATIVE PROCESSES.

Wet-collodion Photography. By Charles W. Gamble. 1s.
The Wet Collodion Process. By Arthur Payne. 3s.
Collodion Emulsion. By H. O. Klein. 5s.
Practical Orthochromatic Photography. By Arthur Payne. 1s.
The Photography of Coloured Objects. By C. E. Kenneth Mees, D.Sc. 1s.
Negative-making. By Sir William Abney, F.R.S. 1s
The Watkins' Manual (of exposure and development). By Alfred Watkins. 1s.
Photography by Rule. By J. Sterry. 1s.
Finishing the Negative. Edited by H. Snowden Ward. 1s.
Retouching. By Arthur Whiting. 1s.
Art of Retouching. By J. Hubert. 1s.
Art of Retouching Negatives, and Finishing and Colouring Photographs. By Robert Johnson. 2s.

PRINTING PROCESSES.

Photographic and Photo-mechanical Printing Processes. By W. K. Burton. 4s.
Art and Practice of Silver Printing. By Sir William Abney and Robinson. 2s. 6d.
Bromide Enlarging and Contact Printing. By S. Herbert Fry. 6d.
Toning Bromide Prints. By R. Blake Smith. 1s.
Toning Bromides. By C. W. Somerville. 1s.

Toning Bromide and Gaslight Prints. (No. 103 of "The Photo-Miniature.")

Photographic Enlargements: How to Make Them. By Geo. Wheeler. 1s.

A B C Guide to Autotype Permanent Photography. By J. R. Sawyer, 1s.

Carbon Printing. By E. J. Wall. 1s.

Photo-aquatint, or Gum Bichromate Process. By Alfred Maskell and R. Demachy. 1s.

Oil and Bromoil Printing. (No. 106 of "The Photo-Miniature.")

Platinotype Printing. By A. Horsley Hinton. 1s.

Ferric and Heliographic Processes. By George E. Brown. 2s.

Photographic Reproduction Processes. By P. C. Duchochois. A treatise on photographic impressions without silver salts. 2s. 6d.

Photo-ceramics. By W. Ethelbert Henry, C.E., and H. Snowden Ward. 1s. 6d.

Trimming, Mounting, and Framing. (No. 102 of "The Photo-Miniature.")

Lanterns and Lantern Slides: Cinematograph.

Modern Magic Lanterns. By R. Child Bayley. 1s.

The Lantern, and How to Use It. By Goodwin Norton. 1s.

Optical Projection. By Lewis Wright. 6s.

The Optical Lantern: for Instruction and Amusement. By Andrew Pringle. 2s. 6d.

Colouring Lantern Slides. (No. 83 of "The Photo-Miniature.")

Living Pictures. By H. V. Hopwood. 2s. 6d.

Animated Photography. By Cecil M. Hepworth. 1s.

Photo-Mechanical Processes, Etc.

Half-tone Process, The. By Julius Verfasser. 5s.

Half-tone Process on the American Basis. By Wm. Cronenberg. 2s.

A Treatise on Photogravure in Intaglio. By the Talbot Klic process. By Herbert Denison. 4s. 6d

Photo-Mechanical Processes. By W. T. Wilkinson. 4s.

Photo-aquatint and Photogravure. By Thomas Huson. 2s.

Professional Photography. By C. H. Hewitt. Vol. I., 1s. Vol. II., 1s.

Photography for the Press. By the Editors of *The Photographic Monthly.* 1s.

Practical Radiography. A handbook of the applications of the X-rays. By A. W. Isenthal and H. Snowden Ward. 6s.

Colour Photography.

Photography in Colours. By Bolas, Tallent and Senior. 1s. 6d.

Three-colour Photography. By Baron von Hübl. Translated by H. O. Klein. 7s. 6d.

Natural-colour Photography. By Dr. E. König. Translated by E. J. Wall. 2s.

The Copyright (Works of Art) Act (1862).

An Act for Amending the Law relating to Copyright in Works of the Fine Arts, and for Repressing the Commission of Fraud in the Production and Sale of Such Works.

WHEREAS by law, as now established, the authors of paintings, drawings, and photographs have no copyright in such their works, and it is expedient that the law should in that respect be amended: Be it therefore enacted by the Queen's Most Excellent Majesty, by and with the advice and consent of the Lords spiritual and temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:—

Copyright in Works Hereafter Made or Sold to Vest in the Author for his Life, and for Seven Years after his Death.

1. The author, being a *British* subject or resident within the dominions of the Crown, of every original painting, drawing, and photograph which shall be or shall have been made either in the *British* dominions or elsewhere, and which shall not have been sold or disposed of before the commencement of this Act, and his assigns, shall have the sole and exclusive right of copying, engraving, reproducing, and multiplying such painting or drawing, and the design thereof, or such photograph, and the negative thereof, by any means and of any size, for the term of the natural life of such author, and seven years after his death; provided that when any painting or drawing, or the negative of any photograph, shall for the first time after the passing of this Act be sold or disposed of, or shall be made or executed for or on behalf of any other person for a good or a valuable consideration, the person so selling or disposing of or making or executing the same shall not retain the copyright thereof, unless it be expressly reserved to him by agreement in writing, signed, at or before the time of such sale or disposition, by the vendee or assignee of such painting or drawing, or of such negative of a photograph, or by the person for or on whose behalf the same shall be so made or executed; but the copyright shall belong to the vendee or assignee of such painting or drawing, or of such negative of a photograph, or to the person for or on whose behalf the same shall have been made or executed; nor shall the vendee or assignee thereof be entitled to any such copyright, unless, at or before the time of such sale or disposition, an agreement in writing, signed by the person so selling or disposing of the same, or by his agent duly authorised, shall have been made to that effect.

Copyright not to Prevent the Representation of the Same Subjects in Other Works.

2. Nothing herein contained shall prejudice the right of any person to copy or use any work in which there shall be no copyright, or to represent any scene or object, notwithstanding that

there may be copyright in some representation of such scene or object.

Assignments, Licences, etc., to be in Writing.

3. All copyright under this Act shall be deemed personal or moveable estate, and shall be assignable at law, and every assignment thereof, and every licence to use or copy by any means or process the design or work which shall be the subject of such copyright, shall be made by some note or memorandum in writing, to be signed by the proprietor of the copyright, or by his agent appointed for that purpose in writing.

Register of Proprietors of Copyrights in Paintings, Drawings, and Photographs to be kept at Stationers' Hall, as in 5 and 6 Vict., cap. 45.

4. There shall be kept at the Hall of the Stationers' Company by the Officer appointed by the said Company for the purposes of the Act passed in the sixth year of Her present Majesty, intituled *An Act to Amend the Law of Copyright*, a book or books, entitled "The Register of Proprietors of Copyright in Paintings, Drawings, and Photographs," wherein shall be entered a memorandum of every copyright to which any person shall be entitled under this Act, and also of every subsequent assignment of any such copyright; and such memorandum shall contain a statement of the date of such agreement or assignment, and of the names of the parties thereto, and of the name and place of abode of the person in whom such copyright shall be vested by virtue thereof, and of the name and place of abode of the author of the work in which there shall be such copyright, together with a short description of the nature and subject of such work and in addition thereto, if the person registering shall so desire, a sketch, outline, or photograph of the said work, and no proprietor of any such copyright shall be entitled to the benefit of this Act until such registration, and no action shall be sustainable nor any penalty recoverable in respect of anything done before registration.

Certain Enactments of 5 and 6 Vict., c. 45. to Apply to the Books to be Kept under this Act.

5. The several enactments in the said Act of the sixth year of Her present Majesty contained, with relation to keeping the register book thereby required, and the inspection thereof, the searches therein, and the delivery of certified and stamped copies thereof, the reception of such copies in evidence, the making of false entries in the said book, and the production in evidence of papers falsely purporting to be copies of entries in the said book the application to the Courts and Judges by persons aggrieved by entries in the said book, and the expunging and varying such entries, shall apply to the book or books to be kept by virtue of this Act, and to the entries and assignments of copyright and proprietorship therein under this Act, in such and the same manner as if such enactments were here expressly enacted in relation thereto, save and except that the forms of entry prescribed by the said Act of the sixth year of Her present Majesty

may be varied to meet the circumstances of the case, and that the sum to be demanded by the officer of the said Company of Stationers for making any entry required by this Act shall be one shilling only.

Penalties on Infringement of Copyright.

6. If the author of any painting, drawing, or photograph in which there shall be subsisting copyright, after having sold or disposed of such copyright, or if any other person, not being the proprietor for the time being of copyright in any painting, drawing, or photograph, shall, without the consent of such proprietor, repeat, copy, colourably imitate, or otherwise multiply for sale, hire, exhibition, or distribution, or cause or procure to be repeated, copied, colourably imitated, or otherwise multiplied for sale, hire, exhibition, or distribution, any such work or the design thereof, or, knowing that any such repetition, copy, or other imitation has been unlawfully made, shall import into any part of the United Kingdom, or sell, publish, let to hire, exhibit or distribute, or offer for sale, hire, exhibition, or distribution, or cause or procure to be imported, sold, published, let to hire, distributed, or offered for sale, hire, exhibition, or distribution, any repetition, copy, or imitation of the said work, or of the design thereof, made without such consent as aforesaid, such person for every such offence shall forfeit to the proprietor of the copyright for the time being a sum not exceeding ten pounds; and all such repetitions, copies, and imitations, made without such consent as aforesaid, and all negatives of photographs made for the purpose of obtaining such copies, shall be forfeited to the proprietor of the copyright.

Penalties on Fraudulent Productions and Sales.

7. No person shall do or cause to be done any or either of the following Acts: that is to say,—

First, no person shall fraudulently sign or otherwise affix, or fraudulently cause to be signed or otherwise affixed to or upon any painting, drawing, or photograph, or the negative thereof, any name, initials, or monogram:

Secondly, no person shall fraudulently sell, publish, exhibit, or dispose of, or offer for sale, exhibition, or distribution, any painting, drawing, or photograph, or negative of a photograph, having thereon the name, initials, or monogram, of a person who did not execute or make such work:

Thirdly, no person shall fraudulently utter, dispose, or put off, or cause to be uttered or disposed of, any copy or colourable imitation of any painting, drawing, or photograph, or negative of a photograph, whether there shall be subsisting copyright therein or not, as having been made or executed by the author or maker of the original work from which such copy or imitation shall have been taken.

Fourthly, where the author or maker of any painting, drawing, or photograph, or negative of a photograph, made either before or after the passing of this Act, shall have sold or otherwise

parted with the possession of such work, if any alteration be afterwards made therein by any other person, by addition or otherwise, no person shall be at liberty, during the life of the author or maker of such work, without his consent, to make or knowingly to sell or publish, or offer for sale, such work or any copies of such work so altered as aforesaid, or of any part thereof, as or for the unaltered work of such author or maker.

Penalties.

Every offender under this section shall, upon conviction, forfeit to the person aggrieved a sum not exceeding ten pounds, or not exceeding double the full price, if any, at which all such copies, engravings, imitations, or altered works shall have been sold or offered for sale; and all such copies, engravings, or imitations, or altered works shall be forfeited to the person, or the assigns, or legal representatives of the person whose name, initials, or monogram shall be so fraudulently signed or affixed thereto, or to whom such spurious or altered work shall be so fraudulently or falsely ascribed as aforesaid: Provided always, that the penalties imposed by this section shall not be incurred unless the person whose name, initials, or monogram shall be so fraudulently signed or affixed, or to whom such spurious or altered work shall be so fraudulently or falsely ascribed as aforesaid, shall have been living at or within twenty years next before the time when the offence may have been committed.

Recovery of Pecuniary Penalties.

8. All pecuniary penalties which shall be incurred, and all such unlawful copies, imitations, and all other effects and things as shall have been forfeited by offenders, pursuant to this Act, and pursuant to any Act for the protection of copyright engravings, may be recovered by the person hereinbefore and in any such Act as aforesaid empowered to recover the same respectively, and hereinafter called the complainant or the complainer, as follows:—

In *England* and *Ireland*, either by action against the party offending or by summary proceeding before any two Justices having jurisdiction where the party offending resides:

In *Scotland*, by action before the Court of Session in ordinary form, or by summary action before the Sheriff of the County where the offence may be committed or the offender resides, who, upon proof of the offence or offences, either by confession of the party offending or by the oath or affirmation of one or more credible witnesses, shall convict the offender, and find him liable to the penalty or penalties aforesaid, as also in expenses; and it shall be lawful for the Sheriff, in pronouncing such judgment for the penalty or penalties and costs, to insert in such judgment a warrant, in the event of such penalty or penalties and costs not being paid, to levy and recover the amount of the same by poinding: Provided always, that it shall be lawful to the Sheriff, in the event of his dismissing the action

and assoilzieing the defender, to find the complainer liable in expenses, and any judgment as to be pronounced by the Sheriff in such summary application shall be final and conclusive, and not subject to review by advocation, suspension, reduction, or otherwise.

Superior Courts of Record in which any Action is Pending may Make an Order for an Injunction, Inspection, or Account.

9. In any action in any of Her Majesty's Superior Courts of Record at *Westminster* and in *Dublin*, for the infringement of any such copyright as aforesaid, it shall be lawful for the Court in which such action is pending, if the Court be then sitting, or if the Court be not sitting then, for a judge of such Court, on the application of the plaintiff or defendant respectively, to make such order for an injunction, inspection, or account, and to give such direction respecting such action, injunction, inspection, or account, and the proceedings therein respectively, as to such Court or Judge may seem fit.

Importation of Pirated Works Prohibited.—Application in such Cases of Customs Act.

10. All repetitions, copies, or imitations of paintings, drawings, or photographs, wherein or in the design whereof there shall be subsisting copyright under this Act, and all repetitions, copies, and imitations of the design of any such painting or drawing, or of the negative of any such photograph, which, contrary to the provisions of this Act, shall have been made in any Foreign State, or in any part of the *British* dominions, are hereby absolutely prohibited to be imported into any part of the United Kingdom except by or with the consent of the proprietor of the copyright thereof, or his agent authorised in writing; and if the proprietor of any such copyright, or his agent, shall declare that any goods imported are repetitions, copies, or imitations of any such painting, drawing, or photograph, or of the negative of any such photograph, and so prohibited as aforesaid, then such goods may be detained by the Officers of Her Majesty's Customs.

Saving of Right to Bring Action for Damages.

11. If the author of any painting, drawing, or photograph, in which there shall be subsisting copyright, after having sold or otherwise disposed of such copyright, or if any other person, not being the proprietor for the time being of such copyright, shall, without the consent of such proprietor, repeat, copy, colourably imitate, or otherwise multiply, or cause to procure to be repeated, copied, or colourably imitated, or otherwise multiplied for sale, hire, exhibition, or distribution, any such work or the design thereof, or the negative of any such photograph, or shall import or cause to be imported into any part of the United Kingdom, or sell, publish, let to hire, exhibit, or distribute, or offer for sale, hire, exhibition, or distribution, or cause or procure to be sold, published, let to hire, exhibited or distributed or offered for sale, hire, exhibition, or dis-

tribution, any repetition, copy, or imitation of such work, or the design thereof, or the negative of any such photograph, made without such consent as aforesaid, then every such proprietor, in addition to the remedies hereby given for the recovery of any such penalties, and forfeiture of any such things as aforesaid, may recover damages by and in a special action on the case, to be brought against the person so offending, and may in such action recover and enforce the delivery to him of all unlawful repetitions, copies, and imitations, and negatives of photographs, or may recover damages for the retention or conversion thereof: Provided that nothing herein contained, nor any proceeding, conviction, or judgment, for any act hereby forbidden, shall effect any remedy which any person aggrieved by such Act may be entitled to either at law or in equity.

Provisions of 7 and 8 Vict., c. 12, to be Considered as Included in this Act.

12. This Act shall be considered as including the provisions of the Act passed in the Session of Parliament held in the seventh and eighth years of her Present Majesty, intituled *An Act to Amend the Law Relating to International Copyright*, in the same manner as if such provisions were part of this Act.

Reproduction Fees.

The Copyright Union has drawn attention to the following suggestions, drawn up for the guidance of its members, by Mr. Alfred Ellis:—

Members are advised not to give permission for their copyright photographs to be reproduced until they have full particulars of the size and style of the proposed reproduction, when they can formulate their charges accordingly. For example: a newspaper should pay a fee of not less than 10s. 6d. for half-tone black-and-white reproduction not exceeding 6 by 4 inches, when printed with letterpress in one issue of a newspaper; but, if it is to be printed as an inset, the fee should be at least one guinea. If printed in colours, collotype, or photogravure, it should be a still higher fee. If a photograph is to be reproduced for advertising purposes, a higher fee should be charged than for newspaper work. In all cases the permission must be in writing, and should state the fee to be paid, the process by which the photograph is to be reproduced, and whether in black-and-white or colours, the size limit, and the purpose for which the reproduction may be used.

The fee for reproduction on postcards should be not less than 10s. 6d. royalty per thousand for half-tone or collotype, and £1 1s. per thousand for bromide or ordinary photographic processes.

TABLES.

WEIGHTS AND MEASURES.

The formulæ in the editorial pages of this ALMANAC are given, in almost all cases, in both British and metric measures, and in adopting this course we have had the desire to impress upon photographers the simplicity and facility of the latter system. As a rule, the British formulæ are expressed in grains or ounces per 20 ozs. of solution, and the metric formulæ in grammes per 1000 c.c.s. In regard to the total bulk of solution, our formulæ are mostly drawn up on the basis that the total bulk after the solution of the solids is that stated in the formula—20 ozs. or 1000 c.c.s. as a rule.

The question of a 10 per cent. solution is a point in formulæ making and using which has caused endless discussion; but it is really simple enough if it be borne in mind that the ounce avoirdupois contains 437½ grains, while the fluid ounce contains 480 minims. As 10 per cent. solutions, being strong, are usually measured out in minims, the ounce avoirdupois must be dissolved in enough water to make a solution containing 1 grain in 10 minims; that is to say, 4375 minims, or practically 9 ounces, is the proper bulk for the solution of 1 ounce avoirdupois. But if a solution is to be measured out in fluid ounces, then the 10 per cent. solution will be 1 oz. in 10 fluid ozs.

Throughout this work "grains per ounce" are converted into "grammes per litre" by multiplying by 2·3. Ounces per any given number of fluid ounces are converted by taking the same ratio of grammes to 1000 c.c.s.

In reference to the names of chemicals, "sodium carbonate" and "sodium sulphite" are used for the crystallised forms of these substances. If the "dry" ("anhydrous") forms are meant, one or other of these terms is used in qualification.

British Weights and Measures.

1. APOTHECARIES WEIGHT.*

20 Grains = 1 Scruple.
3 Scruples = 1 Drachm = 60 Grains.
8 Drachms = 1 Ounce = 480 Grains.

2. AVOIRDUPOIS WEIGHT.*

437½ Grains = 1 Ounce.
16 Ounces = 1 Pound = 7000 Grains.
¼ ounce = 109 grains; ½ ounce = 219 grains; ¾ ounce = 328 grains.

3. FLUID MEASURE.

60 Minims = 1 Drachm.
8 Drachms = 1 Ounce = 480 Minims.
20 Ounces = 1 Pint = 160 Drachms = 9600 Minims.
2 Pints = 1 Quart = 40 Ounces = 320 Drachms.
4 Quarts = 1 Gallon = 160 Ounces = 1280 Drachms.

1 fluid ounce of water weighs 437½ grains, therefore every minim weighs 0·91 grains.

Metric Weights and Measures.

The unit of weight is the gramme, written "gm."; the subdivisions are the "deci-" (1/10th), "centi-" (1/100th), and "milligramme" (1/1000th); the multiples are the "deka-" (10 gm.) and "hectogramme" (100 gm.), but in practice it is usual to use the term 0·1 or 0·01 and 10 or 100 grammes, and the abbreviation "kilo." for 1000 gms.

The following are the equivalents of Metric Weights and Measures in terms of Imperial Weights and Measures:—

LINEAR MEASURE.

1 Millimetre (mm.) (1/1000th M.) =	0·03937 inch
1 Centimetre (1/100th M.) .. =	0·3937 „
1 Metre (M.) .. .. .. =	39·370113 inches 3·280843 feet 1.0936143 yards
Kilometre (1000 M.) .. .. =	0·62137 mile

SQUARE MEASURE.

1 Square Centimetre .. .. =	0·155 square inch
1 Square Metre (100 square decimetres) .. .. .. =	10·7639 square feet 1·196 square yards

WEIGHT.	*Avoirdupois.*
1 Milligramme (1/1000th gm.) .. =	0·015 grain
1 Gramme (1 gm.) .. .. =	15·432 „
1 Kilogramme (1000 gm.) .. =	2·2046223 lbs. or 35·273957 ozs.

* It is now customary in formulæ to employ the avoirdupois ounce (437½ grains), but in cases where "drachms" are given the apothecaries' drachm of 60 grains is taken as the unit.

FLUID MEASURE.

1 Cubic centimetre* (c.c.) (1/1000th litre) = 16·9 minims

1 Litre (1 L.) = 35 ozs. 94 m. = 16894·1 minims

Conversion of Metric into British Measures.

GMS. PER LITRE INTO GRAINS PER 10* OZS.

The following table gives the most convenient means of translating metric formulæ into British measures.

* The figures given in Columns 2, 4, and 6 are a correct translation of the metric proportion when the solution is measured out in ounces and fractions of an ounce. If to be measured in minims, the quantities in Columns 2, 4, and 6 are dissolved in 9 ozs. 2 drs. of water.

1 Gms. Per Litre.	2 Grs. Per 10† ozs.	3 Gms. Per Litre.	4 Grs. Per 10† ozs.	4 Ozs. Grs.	5 Gms. Per Litre.	6 Grs. Per 10† ozs.	6 Ozs. Grs.
1	4·4	30	131	¼—22	155	678	1½—22
2	8·8	35	153	¼—44	160	700	1½—44
3	13·1	40	175	¼—66	165	722	1½—66
4	17·5	45	197	¼—88	170	744	1½—88
5	21·9	50	219	½—0	175	766	1¾—0
6	26·2	55	241	½—22	180	788	1¾—22
7	30·6	60	262	½—43	185	809	1¾—43
8	35·0	65	284	½—65	190	831	1¾—65
9	39·4	70	306	½—87	195	853	1¾—87
10	43·8	75	328	¾—0	200	875	2
11	48·1	80	350	¾—22	225	984	2¼
12	52·5	85	371	¾—43	250	1,094	2½
13	56·9	90	393	¾—65	275	1,203	2¾
14	61·2	95	415	¾—87	300	1,313	3
15	65·6	100	437	1—0	325	1,422	3¼
16	70·0	105	459	1—22	350	1,531	3½
17	74·4	110	481	1—44	375	1,641	3¾
18	78·8	115	503	1—66	400	1,750	4
19	83·1	120	525	1—88	425	1,859	4¼
20	87·5	125	547	1¼—0	450	1,969	4½
21	91·9	130	569	1¼—22	475	2,078	4¾
22	96·2	135	591	1¼—44	500	2,187	5
23	100·6	140	613	1¼—66			
24	105·0	145	634	1¼—87			
25	109·4	150	656	1½—0			

† *N.B.*—Quantities in Columns 2, 4, and 6 are dissolved in 9 ozs. 2 drs. when solutions are to be measured out in minims.

* *Millilitre and C C.*—Revisions of metric standards have shown that the litre is not exactly 1000 c.c.s., but 999·84 c.c.s. (according to Mendeeleef's calculations from the experimental data). The difference appears sufficiently serious in official circles to warrant the abandonment of the term "cubic centimetre," and the employment of "millilitre" for the true thousandth part; millilitre to be abbreviated to "mil." On grounds of terminology there is some reason for this, but until "millilitre" commences to oust c.c. from current writings we shall continue to use the latter term. As regards error, the difference is absolutely negligible, not more than 4 drops in 35 ozs.

GRAMMES INTO GRAINS AND OUNCES (AVOIRDUPOIS).

Gms.	Ozs.	Grs.	Gms.	Ozs.	Grs.	Gms.	Ozs.	Grs.
0·1		1·5	16	½	28·1	130	4½	37
0·2		3·1	17	½	43·5	140	4¾	82
0·3		4·6	18	½	59·0	150	5¼	118
0·4		6·2	19	½	74·4	160	5½	61
0·5		7·7	20	½	89·8	170	6	0
0·6		9·1	25	¾	57·0	175	6	76
0·7		10·8	30	1	25	180	6¼	44
0·8		12·4	35	1	103	190	6½	88
0·9		13·9	40	1¼	71	200	7	24
1		15·43	45	1½	38	250	8¾	32
2		30·9	50	1¾	6	300	10½	31
3		46·3	55	1¾	83	350	12¼	41
4		61·7	60	2	51	400	14	50
5		77·2	65	2¼	19	450	15¾	52
6		92·6	70	2¼	94	500	17½	61
7		108·0	75	2½	64	550	19¼	66
8	¼	14·1	80	2¾	32	600	21	70
9	¼	29·5	85	3	0	650	22¾	72
10	¼	44·9	90	3	76	700	24½	81
11	¼	60·4	95	3¼	44	750	26¼	91
12	¼	75·8	100	3½	11	800	28	95
13	¼	91·2	110	3¾	56	850	29¾	102
14	¼	106·7	120	4	102	900	31½	106
15	½	12·7	125	4¼	70	1000	35¼	11

Note.—In the above table the British equivalents are given in the form most convenient for actual work, viz., in even ounces and quarter ounces, with odd grains over. If calculations need to be made, the following figures giving the equivalents of ounces and quarter-ounces in grains will be found useful:—

¼ oz. = 109 grs.	1¾ oz. = 765 grs.	3¼ ozs. = 1,421 grs.	4¾ ozs. = 2,078 grs.
½ oz. = 219 grs.	2 ozs. = 875 grs.	3½ ozs. = 1,531 grs.	5¼ ozs. = 2,296 grs.
¾ oz. = 328 grs.	2¼ ozs. = 984 grs.	3¾ ozs. = 1,640 grs.	5½ ozs. = 2,406 grs.
1 oz. = 437 grs.	2½ ozs. = 1,094 grs.	4 ozs. = 1,750 grs.	6 ozs. = 2,625 grs.
1¼ oz. = 546 grs.	2¾ ozs. = 1,203 grs.	4¼ ozs. = 1,859 grs.	6¼ ozs. = 2,734 grs.
1½ oz. = 656 grs.	3 ozs. = 1,312 grs.	4½ ozs. = 1,969 grs.	6½ ozs. = 2,844 grs.

C.C.S. INTO MINIMS AND OUNCES (FLUID).

C.c.s.	Ozs.	Mins.	C.c.s.	Ozs.	Mins.	C.c.s.	Ozs.	Mins.
		16·9	6		101·4	11		66
		33·8	7		118·3	12		83
		50·7	8		15·2	13		100
		67·6	9		32	14		117
		84·5	10		49	15		13

C.C.S. INTO MINIMS AND OUNCES (FLUID).—*Continued.*

C.c.s.	Ozs.	Mins.	C.c.s.	Ozs.	Mins.	C c.s.	Ozs.	Mins.
16	½	30	120	4	107	500	17½	47
17	½	47	125	4¼	72	525	18¼	110
18	½	64	130	4½	36	550	19¼	52
19	½	81	140	4¾	85	575	20	114
20	½	98	150	5¼	14	600	21	56
25	¾	82	160	5½	63	625	22	0
30	1	27	170	5¾	112	650	22¾	61
35	1	111	175	6	76	675	23¾	4
40	1¼	76	180	6¼	41	700	24½	66
45	1½	40	190	6½	90	725	25½	8
50	1¾	5	200	7	20	750	26¼	70
55	1¾	89	225	7¾	81	775	27¼	13
60	2	54	250	8¾	24	800	28	75
65	2¼	18	275	9½	86	825	29	18
70	2¼	103	300	10½	28	850	29¾	80
75	2½	67	325	11¼	90	875	30¾	22
80	2¾	32	350	12¼	33	900	31½	65
85	2¾	116	375	13	95	925	32½	27
90	3	81	400	14	37	950	33¼	90
95	3¼	45	425	14¾	100	975	34¼	32
100	3½	10	450	15¾	42	1000	35	94
110	3¾	58	475	16½	105			

Conversion of British into Metric Measures.

GRAINS INTO GRAMMES.

Grs.	Gms.	Grs.	Gms.	Grs.	Gms.
1	0·065	16	1·037	35	2·268
2	0·13	17	1·102	40	2·592
3	0·194	18	1·166	45	2·916
4	0·259	19	1·232	50	3·240
5	0·324	20	1·296	55	3·564
6	0·389	21	1·361	60	3·888
7	0·454	22	1·426	65	4·212
8	0·518	23	1·490	70	4·536
9	0·583	24	1·555	75	4·860
10	0·648	25	1·620	80	5·184
11	0·713	26	1·685	85	5·508
12	0·775	27	1·750	90	5·832
13	0·842	28	1·814	95	6·156
14	0·907	29	1·880	100	6·480
15	0·972	30	1·944		

OUNCES (AVOIRDUPOIS) TO GRAMMES.

Ozs.	Gms.	Ozs.	Gms.	Ozs.	Gms.
¼	7·09	4	113·40	13	368·54
½	14·17	5	141·75	14	396·89
¾	21·26	6	170·10	15	425·24
1	28·35	7	198·45	16	453·59
1½	42·5	8	226·80	17	481·94
2	56·70	9	255·15	18	510·29
2½	70·87	11	311·8	19	538·64
3	85·05	12	340·19	20	566·99

FLUID OUNCES AND DRACHMS TO C.C.S.

Minims.	C.c.s.	Drs.	C.c.s.	Ozs.	C.c.s.	Ozs.	C.c.s.
5 =	·3	½	1·78	1½	42·6	11	312·5
10 =	·6	1	3·55	2	56·8	12	341·0
15 =	·9	2	7·10	3	85·2	13	369·3
20 =	1·2	3	10·65	4	113·6	14	398·0
25 =	1·4	4	14·20	5	142·0	15	426·0
		5	17·75	6	170·5	16	454·5
		6	21·30	7	198·9	17	483·0
		7	24·86	8	227·3	18	511·5
		8	28·41	9	255·7	19	540·0
				10	284·0	20	568·0

CONVERSION RULES.

Grammes per litre into grains per ounce.—Multiply the grammes by 0·44.

C.c.s. per litre into minims per ounce.—Divide the c.c.s. by 2 (more exactly, multiply by 0·48).

Grains per ounce into grammes per litre.—Multiply the grains by 2·3. Thus 50 grs. per oz. = 115 gms. per litre.

Minims per ounce into c.c.s. per litre.—Multiply the minims by 2.

COINS AS WEIGHTS.

Silver coinage, it is useful to note, is minted exactly by weight in proportion to its value, viz., $436\,^4/_{11}$ grains for every 5s. Thus the threepenny bit is 21·8 grs.; a sixpence, 43·6; shilling, 87·2; florin, 175·4; half-crown, 218 grs.

Thus the sixpence and threepenny piece are almost exactly one-tenth and one-twentieth of the avoirdupois ounce.

Bronze coinage—Three pennies, or five halfpennies, or ten farthings = 1 oz. (avoirdupois).

i.e, the penny = 145·8 grs.; 1 halfpenny, 87·5; and 1 farthing 43·75 grs.

One sovereign weighs 123·27 grs.; the half-sovereign, 61·63 grs.

¼ oz. (avoir.)	= one-halfpenny and one threepenny piece.
½ " "	= two halfpennies and a farthing.
1 " "	= three pennies (or five halfpennies).
2 " "	= six pennies (or ten halfpennies).
4 " "	= twelve pennies (or twenty halfpennies.)

FRENCH COINS AS METRIC WEIGHTS.

Lord Crawford gives the following table :—

	Silver Coins.		*Bronze Coin*
25 gms... ..	5 francs	10 gms. ..	10 centimes
10 "	2 "	5 " ..	5 "
5 "	1 "	2 " ..	2 "
2½ "	½ " or 50 centimes	1 " ..	1 "

PARTS.

Formulæ given, as many are, in "parts" may be made up by writing gms. for the solid and c.c.s. for the fluid "parts," and converting them into the British measures by any of the tables in this section. Thus: Adurol, 10 parts; sodium sulphite, 100 parts; water 1000 parts becomes adurol, 154 grs.; sodium sulphite, 3 ozs. 230 grs. water, 35 ozs.

INCHES INTO MILLIMETRES. MILLIMETRES INTO INCHES.

Inches.	Millimetres.	Inches.	Millimetres.	Millimetres.	Inches.	Millimetres.	Inches.
1	25·4	$\frac{3}{8}$	9·5	0·1	0·0039	13	0·51
$\frac{15}{16}$	23·8	$\frac{11}{32}$	8·7	0·5	0·015	14	0·55
$\frac{9}{10}$	23·	$\frac{5}{16}$	7·9	1	0·04	15	0·59
$\frac{7}{8}$	22·2	$\frac{9}{32}$	7·1	2	0·08	16	0·63
				3	0·12	17	0·67
$\frac{13}{16}$	20·6	$\frac{1}{4}$	6·4	4	0·16	18	0·71
$\frac{3}{4}$	19·1	$\frac{7}{32}$	5·6	5	0·20	19	0·75
$\frac{11}{16}$	17·5	$\frac{3}{16}$	4·8	6	0·24	20	0·79
				7	0·28	21	0·83
$\frac{5}{8}$	15·9	$\frac{1}{8}$	3·2	8	0·31	22	0·87
$\frac{9}{16}$	14·3	$\frac{3}{32}$	2·4	9	0·53	23	0·90
$\frac{1}{2}$	12·7	$\frac{1}{16}$	1·6	10	0 39	24	0·94
$\frac{7}{16}$	11·1	$\frac{1}{32}$	0·8	11	0·43	25	0·98
				12	0·47	25·4	1·0

ENGLISH SIZES OF PLATES.

Inches.	Cm.	Inches.	Cm.
3½ × 2½	8·9 × 6·4	7 × 5[5]	17·8 × 12·7
3¼ × 3¼[1]	8·25 × 8·25	8½ × 6½[6]	21·5 × 16·5
4¼ × 3¼[2]	10·8 × 8·25	10 × 8	25·4 × 20 3
5 × 4[3]	12·6 × 10·1	12 × 10	30·4 × 25·4
6½ × 4¾[4]	16·5 × 12·0	15 × 12	38·1 × 30·4

[1] Lantern plate. [2] Quarter-plate. [3] Smallest common size in America. [4] Half-plate. [5] Usual medium size in America. [6] Whole-plate.

CONTINENTAL SIZES OF PLATES IN COMMON USE.

Cm.	Inches.	Cm.	Inches.
9 × 12*	3·54 × 4·72	18 × 24	7·08 × 9·44
12 × 16	4·72 × 6·30	24 × 30	9·44 × 11·81
13 × 18†	5·12 × 7·08	30 × 40	11·81 × 15·75
13 × 21	5·12 × 8·25	40 × 50	15·75 × 19·69

* The standard small size, equivalent to the British quarter-plate.
† The standard medium size (British half-plate).

Foreign Lantern Slides.

The standard French size for lantern slides is 10 by 8 cm., though many makers prepare slides 3¼ by 3¼. The American size is 4 by 3¼, though some makers use the English quarter-plate (4¼ by 3¼).

CHEMICAL TABLES.

TABLE OF SYMBOLS AND EQUIVALENT WEIGHTS OF THE MORE IMPORTANT COMPOUNDS USED IN PHOTOGRAPHY.

The atomic weights of the elements employed in working out the equivalent weights given below are the round numbers contained in the first column of the Table of Atomic Weights on page 886.

NAME.	SYMBOL.	EQUIV. WEIGHT
Acetone	$C_3 H_6 O$	58
,, sulphite	$C_3 H_6 OH SO_3 Na$	162
Acid, acetic	$C_2 H_4 O_2$	60
,, benzoic	$C_6 H_5 COOH$	122
,, boric	$H_3 BO_3$	62
,, carbolic	$C_6 H_5 OH$	94
,, chlorochromic	$Cl Cr O_2 OH$	136·5
,, chromic (anhydride)	$Cr O_3$	100
,, citric	$C_6 H_8 O_7 H_2O$	210
,, dithionic	$H_2 S_2 O_6$	162
,, formic	$H_2 CO_2$	46
,, gallic	$C_6 H_2 (OH)_3 COOH H_2 O$	188
,, hydrobromic	$H Br$	81
,, hydrochloric	$H Cl$	36·5
,, hydrofluoric	$H F$	34
,, lactic	$CH_3 CH (OH) COOH$	90
,, nitric	HNO_3	63
,, oxalic	$H_2 C_2 O_4$	126
,, pentathionic	$H_2 S_5 O_6$	258
,, perchromic	$H Cr O_4$	117
,, phosphoric	$H_3 PO_4$	98
,, picric	$C_6 H_2 (NO_2)_3 OH$	139
,, pyrogallic	$C_6 H_3 (OH)_3$	126
,, salicylic	$C_6 H_4 (OH) COOH$	138
,, sulphuric	$H_2 SO_4$	98
,, sulphurous	$H_2 SO_3$	82
,, tannic	$C_{14} H_{10} O_9$	322
,, tartaric	$C_2 H_2 (OH)_2 (COOH)_2$	150
,, tetrathionic	$H_2 S_4 O_6$	225
,, trithionic	$H_2 S_3 O_6$	194
Adurol*	$C_6 H_3 (OH)_2 Cl$ (or Br)	—
Alcohol (methyl)	$CH_3 OH$	32
,, (ethyl)	$C_2 H_5 OH$	46

* Adurol is mono-chlor (or mono-brom) hydroquinone.

TABLES OF SYMBOLS, ETC.—CONTINUED.

NAME.	SYMBOL.	EQUIV. WEIGHT.
Alum, ammonia	$Al_2 (NH_4)_2 (SO_4)_4 24H_2O$	906
„ chrome	$Cr_2 K_2 (SO_4)_4 24H_2O$	998
„ iron ammonia	$Fe_2 (NH_4)_2 (SO_4)_4 24H_2O$	964
„ potash	$Al_2 K_2 (SO_4)_4 24H_2O$	948
Aluminium chloride	$Al_2 Cl_6 12H_2O$	267
„ sulphate	$Al_2 (SO_4)_3 16H_2O$	634
„ sulphocyanide	$Al_2 (CNS)_6$	402
Amidol	$C_6 H_3 OH NH_2 HCl$	144·5
Ammonia	NH_3	17
Ammonium bichromate	$(NH_4)_2 Cr_2 O_7$	252
„ bromide	$NH_4 Br$	98
„ carbonate	$NH_4 HCO_3 + NH_2 COOH NH_4$	—
„ chloride	$NH_4 Cl$	53·5
„ chromate	$(NH_4)_2 Cr O_4$	152
„ citrate	$(NH_4)_2 C_6 H_6 O_7$	226
„ iodide	$NH_4 I$	145
„ molybdate	$(NH_4)_6 Mo_7 O_{24} 4H_2O$	1236
„ nitrate	$NH_4 NO_3$	80
„ oxalate	$(NH_4)_2 C_2O_4 H_2O$	142
„ persulphate	$(NH_4)_2 S_2 O_8$	228
„ phosphate	$(NH_4)_2 HPO_4$	132
„ sulphate	$(NH_4)_2 SO_4$	132
„ sulphide	$NH_4 HS$	51
„ sulphocyanide	$NH_4 CNS$	76
„ vanadate	$NH_4 VO_3$	117
Amyl, acetate	$C_7 H_{14} O_2$	130
„ alcohol	$(CH_3)_2 CH CH_2 CH_2OH$	88
Aniline	$C_6 H_5 NH_2$	93
"Anthion" (potass. persulphate)		
Antimony, sulphide	$Sb_2 S_3$	336
Aurantia	$(C_6H_2(NO_2)_3)_2 N NH_4$	456
Aurine	$C (C_6 H_4 OH)_2 C_6 H_4 O$	290
Barium, bromide	$Ba Br_2 2H_2O$	333
„ chloride	$Ba Cl_2 2H_2O$	244
„ iodide	$Ba I_2$	391
„ nitrate	$Ba (NO_3)_2$	261
„ peroxide	BaO_2	201
„ sulphate	$Ba SO_4$	233
Benzole (benzene)	$C_6 H_6$	78
Borax (*see* Sodium borate)		
Bromine	Br	80
Cadmium, bromide	$Cd Br_2 4H_2O$	344
„ chloride	$Cd Cl_2$	183
„ iodide	$Cd I_2$	366
Calcium, carbide	$Ca C_2$	64
„ carbonate	$Ca CO_3$	100
„ chloride (cryst.)	$Ca Cl_2 6H_2O$	219

TABLE OF SYMBOLS, &c.—CONTINUED.

NAME.	SYMBOL.	EQUIV. WEIGHT.
Calcium, chloride (fused)	$Ca\,Cl_2$	111
,, hypochlorite	$Ca\,(O\,Cl)_2$	153
,, sulphate	$Ca\,SO_4\,2H_2O$	172
,, hydroxide (slaked lime)	$Ca\,(OH)_2$	74
Carbon, bisulphide	$C\,S_2$	76
Celloidin	$C_{12}\,H_{16}\,O_6\,(NO_3)_4$	504
Ceric, sulphate	$Ce\,(SO_4)_2\,4H_2O$	404
Chloral hydrate	$C\,Cl_3\,CH\,(OH)_2$	165·5
Chloroform	$CH\,Cl_3$	119·5
Chrysoidine	$C_6\,H_5\,N_2\,C_6\,H_3\,(NH_2)_2$	211·7
Cobalt, chloride	$Co\,Cl_2\,6H_2O$	238
Copper, bromide	$Cu\,Br_2$	223·5
,, chloride	$Cu\,Cl_2\,2H_2O$	170·5
,, nitrate	$Cu\,(NO_3)_2\,6H_2O$	357·5
,, sulphate	$Cu\,SO_4\,5H_2O$	249·5
Cyanine	$C_{29}\,H_{35}\,N_2\,I$	544
Dextrine	$(C_6\,H_{10}\,O_5)\,x$	—
Diamidophenol	$C_6\,H_3\,OH\,(NH_2)_2$	124
Edinol*		
Eikonogen†	$C_{10}\,H_5\,(OH)\,NH_2\,SO_2\,O\,Na$	263
Eosine	Na or K Salt of	—
	$C_6H_4(CO)_2O(C_6H\,OH\,X_2‡)_2$	—
Erythrosine	$C_6\,H_4\,(CO)_2\,O\,(C_6\,H\,OH\,X_2‡)_2$	—
Ether	$C_4\,H_{10}\,O$	74
Ferrous and ferric salts (See Iron)		
Formaline	40 % sol. of CH_2O	—
Glycerine	$C_3\,H_5\,(OH)_3$	92
Glycin§	$C_6\,H_4\,OH\,NHCH_2\,COOH$	167
Gold, chloride yellow	$H\,Au\,Cl_4\,4H_2O$	412
,, ,, brown	$H\,Au\,Cl_4$	340
,, ,, potassium	$K\,Au\,Cl_4\,2H_2O$	414
,, ,, sodium	$Na\,Au\,Cl_4\,2H_2O$	398
Hydrogen, peroxide	H_2O_2	34
Hydroquinone	$C_6\,H_4\,(OH)_2$	110
Iodine	I	127
Iridious chloride	$Ir\,Cl_3$	299·5
,, tetrachloride	$Ir\,Cl_4$	335
,, potassium ,,	$K_2\,Ir\,Cl\,Cl_6$	484
,, sodium ,,	$Na_2\,Ir\,Cl_6$	452
IRON.		
Ferric chloride (dry)	$Fe_2\,Cl_6$	325

* Edinol is the hydrochloride of γ-amido-oxy-benzyl-alcohol.

† Eikonogen is the sodium salt of amido- β-naphthol- β-monosulphuric acid.

‡ The X in these formulæ may be bromine, iodine, or chlorine, which element in other proportions constitute the various commercial dyes.

§ Glycin is γ-oxyphenyl-glycin or γ-oxyphenyl-amido-acetic acid.

TABLES OF SYMBOLS, &c.—CONTINUED.

NAME.	SYMBOL.	EQUIV. WEIGHT
Ferric chloride (lump)	$Fe_2 Cl_6 12H_2O$	541
,, ammonia citrate, brown	$4 Fe C_6 H_5 O_7 3 (NH_4)_3 C_6H_5O_7 3 Fe (OH)_3$	2030
,, ,, ,, green	$5 Fe C_6H_5O_7 2(NH_4)_3 C_6H_5O_7 NH_4C_6H_7O_7 2H_2O$	1956
,, oxalate	$Fe_2 (C_2 O_4)_3$	376
,, ammonium oxalate	$(NH_4)_3 Fe (C_2 O_4)_3 3H_2O$	428
,, potassium ,,	$K_3 Fe (C_2 O_4)_3 3H_2O$	491
,, sodium ,,	$Na_6 Fe (C_2O_4)_6 11H_2O$	976
Ferrous, chloride (dry)	$Fe Cl_2$	127
,, ,, (cryst.)	$Fe Cl_2 4H_2O$	199
,, oxalate	$Fe C_2 O_4 2H_2O$	180
,, potassium oxalate	$K_2 Fe (C_2 O_4)_2 H_2O$	328
,, sulphate	$Fe SO_4 7H_2O$	278
,, ammonia sulphate	$Fe (NH_4)_2 (SO_4)_2 6H_2O$	392
Lead, acetate	$Pb (C_2 H_3 O_2)_2 3H_2O$	379
,, nitrate	$Pb (NO_3)_2$	331
Lithia, caustic	$Li OH$	24
Lithium, bromide	$Li Br$	87
,, carbonate	$Li_2 CO_3$	74
Lithium, chloride	$Li Cl$ (cryst. has $2H_2O$)	2·5
,, iodide	$Li I$	134
Magnesium, chloride	$Mg Cl_2$	95
,, sulphate	$Mg SO_4 7H_2O$	246
Manganese, peroxide	$Mn O_2$	87
,, sulphate	$Mn SO_4 4H_2O$	225
Mercury	Hg	200
,, bichloride	$Hg Cl_2$	271
,, iodide	$Hg I_2$	454
,, potass. iodide (sol.)	$HgI_2 \cdot 2KI$	786
Metol*	$(C_6H_4OH NHCH_3p)_2 H_2SO_4$	344
Ortol†	$(C_6H_4OH NHCH_3p) + C_6H_4 (OH)_2p$	234
Palladious chloride	$Pd Cl_2$	177
,, potassium chloride	$K_2 Pd Cl_4$	326
Para-amidophenol	$C_6 H_4 NH_2 OH$	109
Phenol (see Acid carbolic)		
Platinum per (or bi)chloride	$H_2 Pt Cl_6 6H_2O$	516·4
Potassium, ammonium chromate	$K NH_4 Cr O_4$	173
,, bicarbonate	$K H CO_3$	100
,, bichromate	$K_2 Cr_2O_7$	294
,, boro-tartrate	$C_2 H_2 (OH)_2 (CO_2)_2 BOK$	214
,, bromide	$K Br$	119
,, carbonate (dry)	$K_2 CO_3$	138

* Metol is the sulphate of mono-methyl-para-amido-phenol.
† Ortol is a mixture of one molecule each of methyl-ortho-amido-phenol and hydroquinone.

TABLES OF SYMBOLS, &c.—Continued.

Name.	Symbol.	Equiv. Weight.
Potassium chlorate	$K\ Cl\ O_3$	122·5
„ chloride	$K\ Cl$	74·5
„ chloro-platinite	$K_2Pt\ Cl_4$	413·4
„ chromate	$K_2\ Cr\ O_4$	194
„ citrate	$K_3\ C_6\ H_5\ O_7\ H_2O$	342
„ cyanide	$K\ C\ N$	65
„ ferricyanide	$K_3\ Fe\ (CN)_6$	329
„ ferrocyanide	$K_4\ Fe\ (CN)_6\ 3H_2O$	422
„ hydrate	$K\ HO$	56
„ iodide	$K\ I$	166
„ metabisulphite	$K_2\ S_2\ O_5$	222
„ nitrate	$K\ NO_3$	101
„ nitrite	$K\ NO_2$	85
„ oxalate	$K_2\ C_2\ O_4\ H_2O$	184
„ percarbonate	$K_2\ C_2\ O_6$	198
„ perchlorate	$K\ Cl\ O_4$	138·5
„ permanganate	$K_2\ Mn_2O_8$	316
„ persulphate	$K_2\ S_2\ O_8$	270
„ sulphate	K_2SO_4	174
„ sulphocyanide	$K\ C\ N\ S$	97
Pyrocatechin	$C_6\ H_4\ (OH)_2$	110
Rochelle salt	$K\ Na\ C_4\ H_4\ O_6\ 4H_2O$	282
Schlippe's salt (sodium sulphantimoniate)	$Na_3\ Sb\ S_4\ 9H_2O$	479
Silver, acetate	$Ag\ C_2\ H_3\ O_2$	167
„ ammonium nitrate	$Ag\ NO_3+2NH_3$	204
„ bromide	$Ag\ Br$	188
„ carbonate	$Ag_2\ CO_3$	276
„ chloride	$Ag\ Cl$	143·5
„ citrate	$Ag\ C_6\ H_5\ O_7$	513
„ fluoride	$Ag\ F\ 4H_2O$	199
„ iodide	$Ag\ I$	235
„ nitrate	$Ag\ NO_3$	170
„ nitrite	$Ag\ NO_2$	154
„ oxalate	$Ag_2\ C_2\ O_4$	304
„ oxide	$Ag_2\ O$	224
„ phosphate	$Ag_3\ PO_4$	419
„ sulphate	$Ag_2\ SO_4$	312
„ sulphide	$Ag_2\ S$	248
„ tartrate	$Ag_2\ C_4\ H_4\ O_6$	363·4
Sodium, acetate	$Na\ C_2\ H_3\ O_2\ 3H_2O$	136
„ „ (fused)	$Na\ C_2\ H_3\ O_2$	102
„ bicarbonate	$Na\ H\ CO_3$	84
„ bichromate	$Na_2\ Cr_2\ O_7\ 2H_2O$	298
„ bisulphite	$Na\ H\ SO_3$	104

TABLES OF SYMBOLS, &c.—Continued.

Name.	Symbol.	Equiv. Weight
Sodium, borate	$Na_2\ B_4\ O_7\ 10H_2O$	382
„ bromide	$Na\ Br\ 2H_2O$	139
„ carbonate (dry)	$Na_2\ CO_3$	106
„ carbonate (cryst.)	$Na_2\ CO_3\ 10H_2O$	286
„ chloride	$Na\ Cl$	58·5
„ chloro-platinate	$Na_2\ Pt\ Cl_6\ 6H_2O$	560·4
„ citrate	$Na_3\ C_6\ H_5\ O_7\ 5\frac{1}{2}H_2O$	357
„ fluoride	$Na\ F$	42
„ hydrate (caustic)	$Na\ OH$	40
„ hydrosulphite*	$Na\ H\ SO_2$	88
„ hyposulphite†	$Na_2\ S_2\ O_3\ 5H_2O$	248
„ iodide	$Na\ I$	150
„ nitrate	$Na\ NO_3$	85
„ nitro-prusside	$Na_4\ Fe_2\ (CN)_{10}\ (NO)_2\ 4H_2O.$	600
„ oxalate	$Na_2\ C_2\ O_4$	134
„ phosphate	$Na_2HPO_4\ 12H_2O$	358
„ tribasic phosphate	$Na_3PO_4\ 12H_2O$	380
„ sulphate (cryst.)	$Na_2\ SO_4\ \cdot 10H_2O$	322
„ sulphide	$Na_2\ S\ 9H_2O$	240
„ sulphite (dry)	$Na_2\ SO_3$	126
„ „ (cryst.)	$Na_2\ SO_3\ 7H_2O$	252
„ tungstate	$Na_{10}\ W_{12}\ O_{41}\ 28H_2O$	379·8
Strontium, bromide	$Sr\ Br_2$	247·5
„ chloride (dry)	$Sr\ Cl_2$	158·5
„ „ (cryst.)	$Sr\ Cl_2\ 2H_2O$	194·5
„ iodide	$Sr\ I_2$	341·5
„ nitrate	$Sr\ (NO_3)_2$	211·5
Thiocarbamide	$CS\ (NH_2)_2$	76
Thiosinamine	$CS\ (NH_2)\ NH\ C_3\ H_5$	116
Thymol	$CH_3\ C_6\ H_3\ OH\ C_3\ H_7$	150
Tin (Stannous) chloride	$Sn\ Cl_2 + 2H_2O$	225
Uranium, acetate	$UO_2\ (C_2\ H_3\ O_2)_2\ 2H_2O$	426
„ chloride	UO_2Cl_2	343
„ nitrate	$UO_2\ (NO_3)_2\ 6H_2O$	504
Zinc, sulphate	$Zn\ SO_4\ 7H_2O$	287

* Called "hyposulphite" by chemists. † Called "thiosulphate" by chemists.

TABLE OF THE SOLUBILITIES OF THE PRINCIPAL SUBSTANCES USED IN PHOTOGRAPHY.

sol.=*soluble;* v.s.=*very soluble;* s.s.=*slightly soluble;* dec.=*decomposed;* insol.=*insoluble.*

Name.	One part is soluble in — parts of water.		100 parts of water dissolve at ordinary temperature.	Solubility in Alcohol, &c.
	Cold.	Boiling		
Acetone	..	..	..	
,, sulphite	v.s.	..	..	s.s.
Acid, acetic	..	..	..	
,, benzoic	380	45	0·27	1 in 2·75 90%
,, boric	29	2·9	3½	1 in 28 90%
,, carbolic	15	..	6·6	v.s.
,, chromic (anhydride)	0·6	v.s.	160	sol. with decomp'.
,, citric	¾	⅓	130	
,, formic	..	..	..	
,, gallic	100	0·3	1	1 in 5 90% alcohol 1 in 40 ether

Acetone.—(Sp. gr. 0·814), boils at 133°F. miscible in all proportions with water, alcohol and ether. 272 gms. dissolve in 100 gms. 20% cane sugar solution at 60° F A solvent of resin, fats, camphor, pyroxylin and celluloid.

Acetic Acid.—The "glacial" acid, which is that implied in formulæ unless a weaker acid is directed, solidifies about 50°. Its sp. gr. is 1·055; it boils at 245°F It is a solvent of gelatine, celluloid, pyroxyline, fats, oils, etc., blisters the skin, strongly absorbs water from the air, and is miscible with water, alcohol, ether, chloroform and glycerine in all proportions.

Formic Acid.—A colourless liquid of 1·22 sp. gr. (=100% acid), miscible with water and alcohol. Weaker solutions are:—1·20 (90%); 1·18 (80%); 1·15 (65%); 1·12 (50%) and 1·06 (25%).

Hydriodic Acid.—A solution of the gas, HI, and obtainable as strong as sp. gr 2·0 (=96% HI). Solution of sp. gr. 1.7 contains about 52%; sp. gr. 1.5, about 43%.

Hydrobromic Acid.—A solution of the gas, HBr., in water. The strongest solution has sp. gr. of 1·78 (=82%); sol. of 1·495 sp. gr. contains 48% HBr.; 1·38, 40%; 1·208, 25%.

Hydrochloric Acid.—A solution of the gas, HCl, in water. The commercial strongest acid has sp. gr. 1·16, and contains about 30% HCl. Impure acid is sold as "spirits of salts."

Hydrocyanic Acid (=Prussic Acid).—The strength of the official acid of the British Pharmacopœia is 2%. A 10% acid is obtainable in the chemical trade. Both are the most deadly and dangerous poisons.

Hydrofluoric Acid is a strongly fuming solution of the gas HF.; it is sold of strengths 40% and 55% HF.

Lactic Acid is sold as a colourless syrupy liquid, miscible with water or alcohol. Sp. gr. 1·21. A weaker acid is also sold commercially containing 50% acid.

TABLE OF THE SOLUBILITIES, &c.—CONTINUED.

Name.	One part is soluble in — parts of water. Cold.	Boiling	100 parts of water dissolve at ordinary temperature.	Solubility in Alcohol, &c.
Acid oxalic	9·5	0·3	10½	
„ phosphoric	..	..	..	
„ picric	100	..	1	1 in 10 90%, also in ether
„ pyrogallic	2¼	v.s.	44	sol. also in ether, not in chloroform
„ salicylic	500	12½	⅕	1 in 3 5, 1 in 2 in ether
„ tannic	0·5	..	20	1 in 0·6, nearly insol. in ether
„ tartaric	¾	⅓	132	
Adurol	..	..	..	
Agar-agar	..	..	..	
Albumen	..	..	..	
Alum, ammonia	8·3	0·24	12	insoluble
„ chrome	6	dec.	16	
„ iron ammonia	3	dec.	33	insoluble
„ potash	10	v.s.	9 6	insoluble
Aluminium, chloride	¼	v.s.	400	soluble
„ sulphate	3	1·1	35	

Nitric Acid.—Strongly corrosive liquid of 1·42 sp. gr. (=71% HNO_3); soluble in water; oxidises alcohol and other organic solvents.

Phosphoric Acid.—Sold as syrupy liquid, that of 1·75 sp. gr. (=about 90% acid), being intended when "phosphoric acid" is prescribed in formulæ.

Sulphuric Acid.—The commercial strong acid is a thick corrosive liquid of 1·84 sp. gr. (=98% H_2SO_4). It absorbs water rapidly from the air, and, mixed with water, great heat is developed. The acid should always be added to water—not *vice versa.*

Sulphurous Acid.—Solution in water of the gas SO_2; saturated solution of 1·046 is equivalent to 9·5% H_2SO_3, but soon loses strength.

Albumen.—On heating the cold solution to 160°F. the albumen separates in nsoluble form. Alcohol similarly coagulates albumen.

Methyl Alcohol (sp. gr. 0·814).—The chief constituent of crude "wood spirit," or wood naphtha, in which is usually 10% of acetone.

Ethyl Alcohol forms "absolute alcohol" (sp. gr. 0·830 to 0·834), which contains from 2 to 5% water. Alcohol containing 16% water is "rectified spirit." "Methylated" spirit consists of rectified spirit *plus* 10% crude wood spirit and ⅛% mineral naphtha, the latter precipitating as a milkiness on addition of water. These various forms of alcohol mix with water, which can be abstracted with dry potassium carbonate.

Aluminium Chloride.—100 gms. saturated solution (sp. gr., 1·35) contains 41·1 gms aluminium chloride.

TABLES OF THE SOLUBILITIES, &c.—CONTINUED.

Name.	One part is soluble in — parts of water. Cold.	Boiling.	100 parts of water dissolve at ordinary temperature.	Solubility in Alcohol, &c.
Aluminium, sulphocyanide	..	..	..	
Amidol	4	v.s.	24	less sol. in alc. & oth.
Ammonium, bichromate	5	¼	20	1 in 31 absolute alc.
" bromide	1·4	v.s.	72	
" carbonate	4	dec.	25	
" chloride	3	1·4	35	
" citrate	½	v.s.	200	
" iodide	0 6	v.s.	165	1 in 4 alc., s.s. in ether
" molybdate	2½	dec.	40	
" nitrate	½	v.s.	200	
" oxalate	23	2·4	4·3	sol.
" persulphate	1½	dec.	65	
" (hydro) sulphide	..	..	..	
" sulphocyanide	0 6	v.s.	160	v.s.
" vanadate	s.s.	v.s.	..	
Amyl, acetate	..	..	..	
" alcohol	..	..	..	
Aniline	..	..	..	
Antimony sulphide	insol.	..	..	
Aurantia	s.s.	..	..	v.s.; s.s. in ether
Aurine	s.s.	..	..	sol.; also in ether
Barium bromide	0·75	0·5	133	v.s. in benzole
" chloride	2·4	1·3	42	insol.
" iodide	½	v.s.	200	1 in 20 alcohol
" nitrate	12	3 1	8	insol.
Bromine	31	..	3·2	
Cadmium, bromide	0·94	v.s.	106	1 in 3 alc ; 1 in 250 eth.
,, ammonium bromide	0·7	v.s.	137	
" chloride	0·71	0·67	140	1 in 8 alcohol
" iodide	1·08	0·75	93	1 in 1 alc.; 1 in 3 6 eth.
Calcium, chloride (cryst.)	¼	v.s.	400	
" " (fused)	1·4	0·65	70	
" sulphate	380	450	0·3	
" hydroxide	700	1·300	0·137	
Ceric sulphate	12	200	8·3	
Chloral hydrate	¼	..	400	1 in 1/5 90%, 1 in 50 carbon bisulphide.

Aluminium Sulphocyanide is purchased as a reddish solution of 1·16 sp. gr.
Ammonium Sulphide is sold as a deep yellow solution containing also polysulphides.
Amyl Acetate.—Liquid of sp. gr. 0·876, miscible with alcohol and ether but not with water. A solvent of fats, oils, resin, pyroxyline and celluloid.
Amyl Alcohol, the chief constituent of fusel oil, is not miscible with water.
Aniline (sp. gr. 1·036) is freely miscible with alcohol or ether, but only very slightly with water. It boils at 356° F. and coagulates albumen.

TABLES OF THE SOLUBILITIES, &c.—Continued.

Name.	One part is soluble in — parts of water. Cold.	Boiling.	100 parts of water dissolve at ordinary temperature.	Solubility in Alcohol, &c.
Copper bromide	v.s	v.s.	..	
„ chloride	0·83	v.s.	121	v.s.; also in ether.
„ sulphate	2½	½	40	
Cyanine	s.s.	..	..	
Diamidophenol	sol.	..	..	
Edinol	sol.	..	..	[cohol or ether.
Eikonogen	25	..	4.2	nearly insol. in al-
Eosine	sol.	..	..	insol. in ether.
Ether	12	..	8	
Erythrosine	s.s.	..	..	s.s.
Glycerine	..	..	..	
Glycin	..	..	..	
Gold, chloride	v.s.	v.s.	..	
Hydroquinone	17	..	6	
Iodine	insol.	insol.	..	sol.; also in carbon bisulphide
Iron				
Ferric chloride (lump)	v.s.	v.s.	..	
„ „ (dry)	0·63	v.s.	160	
„ ammonium citrate	4	..	25	
(brown)*	..	..	..	
„ „ (green)†	..	..	..	
„ oxalate	..	..	..	
„ ammonium oxalate	2·1	..	0·48	
„ potassium „	15	0·85	6·6	insol.
„ sodium „	1·69	0·55	60	
Ferrous chloride (dry)	2	v.s.	50	
„ „ (cryst.)	0·68	v.s.	147	
„ oxalate	4500	3800	..	
„ potass. oxalate	..	..	..	
„ sulphate	1·43	0 27	70	
„ am. sulphate	3	..	33	
Lead, acetate	1½	0·5	66	1 in 15 alcohol;
Lead, nitrate	2	0·7	50	insol. in ether.

Ether (called also "sulphuric ether") is very volatile and inflammable. Boils at 95° F., sp. gr. 0·722.

Formaline.—A commercial strong solution (40%) of formic aldehyde, CH_2O.

Gelatine becomes swollen in cold water and dissolves in hot. Dissolved in the cold by oxalic, acetic, hydrochloric, and nitric acids, barium chloride and chloral hydrate. Precipitated from its solution in water by alcohol.

Glycerine.—Miscible with water or alcohol. Sp. gr. 1·265.

Iodine dissolves freely also in carbon bisulphide or potassium iodide solution.

Ferric Oxalate is very soluble, over 20%, it is partially reduced to ferrous oxalate on heating the solution to 212° F.

Seven parts of ferrous sulphate correspond to 10 parts ferrous ammonium sulphate. * 21·7-22·4% iron † 14 to 15% iron.

TABLES OF THE SOLUBILITIES, &c.—CONTINUED.

Name.	One part is soluble in — parts of water. Cold.	Boiling.	100 parts of water dissolve at ordinary temperature.	Solubility in Alcohol, &c.
Lithia, caustic	s.s.	..	..	
Lithium, bromide	0·7	0·4	143	
" carbonate	72	138	1·3	v.s.
" chloride	1¼	0·8	80	
" iodide	0·61	0·2	164	v.s.
Magnesium, chloride (dry)	1·7	1½	60	v.s.
" sulphate	1	0·15	100	
Manganese, sulphate	0·8	1	120	
Mercury, bichloride	16	1·8	6·3	insol. in absolute alc.
" iodide	150	..	0·66	1 in 4·90%
Metol	sol.	..	..	
Ortol	sol.	..	.	s.s.; also in ether
Para-amido-phenol	10	..	10	
Phenol (*see* acid carbolic)				1 in 22
Potassium, bicarbonate	4	dec.	25	
" bichromate	10	1	10	
" borotartrate	¾	v.s.	135	
" bromide	1½	1	65	
" carbonate (dry)	0·9	0·64	112	1 in 750
" chlorate	17	2	6	insol.
" chloride	3	1·75	33	insol.
" chloroplatinite	6	v.s.	17	
" chromate	2	1·2	50	insol.
" citrate	0·6	v.s.	166	insol.
" cyanide	0·8	v.s.	122	v.s.
" ferricyanide	2½	1·3	40	1 in 9
" ferrocyanide	3·4	2	29	
" hydrate	½	v.s.	200	insol.; insol. in eth.
" iodide	0·7	½	140	sol.
" metabisulphite	sol.	dec.	..	1 in 16, 90%
" nitrate	3½	0·4	28	
" nitrite	1	v.s.	100	
" oxalate	3	v.s.	33	insol.
" percarbonate	15	dec.	6·5	
" perchlorate	100	5	1	
" permanganate	16	..	6·25	
" persulphate	50	dec.	2	
" sulphocyanide	0·46	v.s.	220	insol. in absolute alc.
" acid sulphate	2	0·8	50	
Pyrocatechin	1¼	v.s.	80	
Rochelle salt	1½	v.s.	66	
Schlippe's salt	3	v.s.	33	

TABLE OF THE SOLUBILITIES, &c.—Continued.

Name.	One part is soluble in — parts of water. Cold.	Boiling.	100 parts water dissolve at ordinary temperature.	Solubility in Alcohol, &c.
Silver, acetate	100	..	1	
,, carbonate	insol.	..	..	
,, chlorate	5	2	20	
,, citrate[1]	insol.	..	..	
,, cyanide	insol.	..	..	
,, fluoride[2]	v.s.	v.s.	..	
,, nitrate	0·44	0·1	227	1 in 26, 90%
,, nitrite	s.s.	..	..	
sulphate	87	..	1·15	
sulphocyanide	insol.	..	..	
,, tartrate	insol.	..	..	
Sodium, acetate	2·8	v.s.	36	1 in 50, 90%; insol. in ether
,, bicarbonate	11·3	dec.	8·8	
,, bichromate	1	0·6	100	
,, bisulphite	v.s.	..	..	
,, borate	12½	½	8	
,, bromide	1·1	0·9	90	1 in 15
,, carbonate (dry)	6	2·2	16·2	
,, ,, (cryst.)	1·56	v.s.	63·2	
,, chloride	3	2½	35	
,, chloroplatinate	sol.	..	..	
,, citrate	sol.	..	..	s.s.
,, fluoride	25	..	4	
,, hydrate (caustic)	v.s.	v.s.	..	
,, hyposulphite	0·6	v.s.	170	insol.
,, iodide	0·6	0·4	166	
,, nitrate	1·1	0·6	85	
,, oxalate	35	..	3	
,, phosphate	6·7	1	15	
,, sulphide	v.s.	v.s.	..	
,, sulphite (cryst.)	2·2	1	45	
,, ,, (dry)	4	..	25	
,, tri-basic phosphate	0·5	v.s.	20	
,, tungstate	8 to 12	..	..	insol.
,, (meta) vanadate	½	v.s.	200	
Strontium, bromide	1·01	½	100	1 in 30, 90%
,, chloride	1·96	1	51	
,, ,, (cryst.)	1·33	0·6	75	
,, iodide	0·56	0·25	18	
,, nitrate	1·41	1	71	
Thiocarbamide	11	v.s.	9	v.s. also in ether

1. Readily soluble in ammonia and hypo.
2. $AgF.4H_2O$ is almost as soluble as calcium chloride.

TABLE OF THE SOLUBILITIES, &c.—Continued.

Name.	One part is soluble in — parts of water. Cold.	Boiling	100 parts of water dissolve at ordinary temperature.	Solubility in Alcohol, &c.
Thiosinamine	17	..	6	1 in 2 90 %; also in eth.
Thymol	330	..	0·3	1 in 3·75 90%; also in [ether.
Tin (stannous), chloride..	1¼	v.s.	66	
Uranium, acetate........	v.s.	v.s.	..	
" chloride	v.s.	v.s.	..	
" nitrate........	½	v.s.	200	
Zinc, sulphate	0·62	0·15	161	

PERCENTAGE OF REAL AMMONIA IN SOLUTIONS OF DIFFERENT DENSITIES AT 14° CENTIGRADE.—Carius.

Specific Gravity.	Percentage Ammonia	Specific Gravity.	Percentage Ammonia	Specific Gravity.	Percentage Ammonia	Specific Gravity.	Percentage Ammonia
0·8844	36·0	0·9052	27·0	0·9314	18·0	0·9631	9·0
0·8864	35·0	0·9078	26·0	0·9347	17·0	0·9670	8·0
0·8885	34·0	0·9106	25·0	0·9380	16·0	0 9709	7·0
0·8907	33·0	0·9133	24·0	0·9414	15·0	0·9749	6·0
0·8929	32·0	0·9162	23 0	0·9449	14·0	0·9790	5·0
0·8953	31·0	0·9191	22·0	0 9484	13·0	0 9831	4·0
0·8976	30·0	0·9221	21·0	0·9520	12·0	0·9873	3·0
0·9001	29·0	0 9251	20 0	0·9556	11·0	0·9915	2·0
0·9026	28·0	0·9283	19·0	0·9503	10·0	0 9959	1·0

INDICATORS

(I.e., Colour Tests for Alkalies and Acids).

	Acid.	Alkaline.	In presence of Carbon Dioxide.
Litmus	Bright red	Blue	Reddish purple
Cochineal	Yellow	Reddish violet	Not affected
Methyl orange ..	Red	Yellow brown	Not affected
Phenol-phthalein	Colourless	Intense red	Useless

Reaction of Substances to Various Indicators.

Substance.	Litmus.	Methyl Orange.	Phenol-phthalein.
Alum	acid	neutral	acid
Borax	alkaline	alkaline	neutral
Potass. metabisulphite.......	acid	neutral	acid
Potass. oxalate	neutral	neutral	neutral
Rochelle salt	neutral	neutral	neutral
Silver nitrate	acid	neutral	acid
Sodium bicarbonate	alkaline	alkaline	neutral
Sodium citrate	alkaline	alkaline	neutral
Sodium bisulphite	acid	neutral	acid
Sodium sulphite............	alkaline	alkaline	neutral
Sodium phosphate	neutral	alkaline	neutral

Thermometric Rules.

The following rules for the rapid conversion of degrees in one system into another will be found useful:—

To Convert Centigrade into Fahrenheit:

Degrees Centigrade $\times 9 \div 5 + 32$.

Ex.—$80°$ C. $\times 9 \div 5 = 144 + 32 = 176°$ F.

To Convert Centigrade into Réaumur:

Degrees Centigrade $\times 4 \div 5$.

Ex.—$60°$ C. $\times 4 \div 5 = 48°$ R.

To Convert Fahrenheit into Centigrade:

(Degrees Fahrenheit $- 32) \times 5 \div 9$.

Ex.—$100°$ F. $- 32 = 68 \times 5 \div 9 = 37{\cdot}8$ C.

To Convert Fahrenheit into Réaumur:

(Degrees Fahrenheit $- 32) \div 9 \times 4$.

Ex.—$95°$ F. $- 32 = 63 \div 9 \times 4 = 28°$ R.

To Convert Réaumur into Centigrade:

Degrees Réaumur $\times 5 \div 4$.

Ex.—$80°$ R. $\times 5 \div 4 = 100°$ C.

To Convert Réaumur into Fahrenheit:

Degrees Réaumur $\times 9 \div 4 + 32$.

Ex.—$16°$ R. $\times 9 \div 4 = 36 + 32 = 68°$ F.

THERMOMETRIC TABLES,

Showing the Assimilation of the Thermometers in Use throughout the World.

Centigrade.	Réaumur.	Fahrenheit.	Centigrade.	Réaumur.	Fahrenheit.
100	80·0	212·0	49	39·2	120·2
99	79·2	210·2	48	38·4	118·4
98	78·4	208·4	47	37·6	116·6
97	77·6	206·6	46	36·8	114·8
96	76·8	204·8	45	36·0	113·0
95	76·0	203·0	44	35·2	111·2
94	75·2	201·2	43	34·4	109·4
93	74·4	199·4	42	33·6	107·6
92	73·6	197·6	41	32·8	105·8
91	72·8	195·8	40	32·0	104·0
90	72·0	194·0	39	31·2	102·2
89	71·2	192·2	38	30·4	100·4
88	70·4	190·4	37	29·6	98·6
87	69·6	188·6	36	28·8	96·8
86	68·8	186·8	35	28·0	95·0
85	68·0	185·0	34	27·2	93·2
84	67·2	183·2	33	26·4	91·4
83	66·4	181·4	32	25·6	89·6
82	65·6	179·6	31	24·8	87·8
81	64·8	177·8	30	24·0	86·0
80	64·0	176·0	29	23·2	84·2
79	63·2	174·2	28	22·4	82·4
78	62·4	172·4	27	21·6	80·6
77	61·6	170·6	26	20·8	78·8
76	60·8	168·8	25	20·0	77·0
75	60·0	167·0	24	19·2	75·2
74	59·2	165·2	23	18·4	73·4
73	58·4	163·4	22	17·6	71·6
72	57·6	161·6	21	16·8	69·8
71	56·8	159·8	20	16·0	68·0
70	56·0	158·0	19	15·2	66·2
69	55·2	156·2	18	14·4	64·4
68	54·4	154·4	17	13·6	62·6
67	53·6	152·6	16	12·8	60·8
66	52·8	150·8	15	12·0	59·0
65	52·0	149·0	14	11·2	57·2
64	51·2	147·2	13	10·4	55·4
63	50·4	145·4	12	9·6	53·6
62	49·6	143·6	11	8·8	51·8
61	48·8	141·8	10	8·0	50·0
60	48·0	140·0	9	7·2	48·2
59	47·2	138·2	8	6·4	46·4
58	46·4	136·4	7	5·6	44·6
57	45·6	134·6	6	4·8	42·8
56	44·8	132·8	5	4·0	41·0
55	44·0	131·0	4	3·2	39·2
54	43·2	129·2	3	2·4	37·4
53	42·4	127·4	2	1·6	35·6
52	41·6	125·6	1	0·8	33·8
51	40·8	123·8	0	0·0	32·0
50	40·0	122·0			

A TABLE OF ATOMIC WEIGHTS OF THE CHEMICAL ELEMENTS.

NAME.	Symbol.	Atomic Weight in Round Numbers.	Accurate Atomic Weight.
Aluminium	Al	27	27·1
Antimony	Sb	120	120·2
Argon	A	40	39·9
Arsenic	As	75	75·0
Barium	Ba	137	137·43
Beryllium	Be = Gl	9·1	9·1
Bismuth	Bi	208	208·0
Boron	B	11	11·00
Bromine	Br	80	79 96
Cadmium	Cd	112	112·4
Cæsium	Cs	133	132·9
Calcium	Ca	40	40·1
Carbon	C	12	12·0
Cerium	Ce	140	140·25
Chlorine	Cl	35 5	35·451
Cromium	Cr	52	52·11
Cobalt	Co	59	59·00
Copper	Cu	63·5	63·60
Erbium	Er	166	166·0
Fluorine	F	19	19·0
Gadolinium	Gd	156	156·01
Gallium	Ga	70	70·0
Germanium	Ge	72·5	72·5
Gold	Au	197	197·2
Helium	He	4	4·0
Hydrogen	H	1	1·008
Indium	In	115	115·0
Iodine	I	127	126·97
Iridium	Ir	193	193·0
Iron	Fe	56	55·9
Lanthanum	La	139	138·9
Lead	Pb	207	206·92
Lithium	Li	7	7·03
Magnesium	Mg	24	24·36
Manganese	Mn	55	55·0
Mercury	Hg	200	200·0

A TABLE OF ATOMIC WEIGHTS—CONTINUED.

NAME.	Symbol.	Atomic Weight in Round Numbers.	Accurate Atomic Weight.
Molybdenum	Mo	96	96·0
Neodymium	Nd	144	143·6
Nickel	Ni	59	58·70
Niobium	Nb=Cb	94	94·0
Nitrogen	N	14	14·04
Osmium	Os	191	191·0
Oxygen (Standard)	O	16	16·0
Palladium	Pd	106	106·5
Phosphorus	P	31	31·0
Platinum	Pt	193·4	194·8
Potassium	K	39	39·15
Praseodymium	Pr	141	140·5
Rhodium................	Rh	103	103·0
Rubidium	Rb	85	85·5
Ruthenium..............	Ru	102	101·7
Samarium	Sm	150	150·3
Scandium	Sc	44	44·1
Selenium	Se	79	79·2
Silicon..................	Si	28	28·4
Silver	Ag	108	107·93
Sodium	Na	23	23·05
Strontium	Sr	87·5	87·6
Sulphur	S	32	32·06
Tantalum	Ta	183	183·0
Tellurium	Te	128	127·6
Terbium	Tb	160	160·0
Thallium................	Tl	204	204·1
Thorium	Th	233	232·5
Thulium	Tu	171	171·0
Tin	Sn	118	119·0
Titanium	Ti	48	48·1
Tungsten................	W	184	184·0
Uranium................	U	240	238·5
Vanadium	V	51	51·4
Ytterbium	Yb	173	173·0
Yttrium	Yt	89	89·0
Zinc	Zn	65	65·4
Zirconium	Zr	91	90·6

TABLE OF POISONS AND ANTIDOTES. Compiled by J. V. Elsden.

	Poisons.	Remarks.	Characteristic Symptoms.	Antidote.
Vegetable Acid.	Oxalic Acid, including Potassium Oxalate	1 drachm is the smallest fatal dose known.	Hot burning sensation in throat and stomach; vomiting, cramps, and numbness.	Chalk, whiting, or magnesia suspended in water. Plaster or mortar can be used in emergency.
Caustic Alkalies.	Ammonia Potash Soda	Vapour of ammonia may cause inflammation of the lungs	Swelling of tongue, mouth, and fauces; often followed by stricture of the œsophagus.	Vinegar and water.
Metallic Salts.	Mercuric Chloride	3 grains the smallest known fatal dose.	Acrid, metallic taste, constriction and burning in throat and stomach, followed by nausea and vomiting.	White and yolk of raw eggs with milk. In emergency, flour paste may be used.
	Acetate of Lead	The sub-acetate is still more poisonous	Constriction in the throat and at pit of stomach; crampy pains and stiffness of abdomen; blue line round the gums.	Sulphates of soda or magnesia. Emetic of sulphate of zinc.
	Cyanide of Potassium	a. Taken internally, 3 grs. fatal.	Insensibility, slow gasping respiration, dilated pupils, and spasmodic closure of the jaws.	No certain remedy: cold affusion over the head and neck most efficacious.
		b. Applied to wounds and abrasures of the skin.	Smarting sensation.	Sulphate of iron should be applied immediately.
	Bichromate of Potassium	a. Taken internally.	Irritant pain in stomach and vomiting.	Emetics and magnesia, or chalk.
		b. Applied to slight abrasions of the skin.	Produces troublesome sores and ulcers.	
	Nitrate of Silver		Powerful irritant.	Common salt to be given immediately, followed by emetics.
Concentrated Mineral Acids.	Nitric Acid	2 drachms have been fatal. Inhalation of the fumes has also been fatal.	Corrosion of windpipe and violent inflammation.	Bicarbonate of soda, or carbonate of magnesia or chalk, plaster of the apartment beaten up in water.
	Hydrochloric Acid	½ ounce has caused death.		
	Sulphuric Acid	1 drachm has been fatal.		
		Acetic Acid, concentrated, has as powerful an effect as the mineral acids.		
	Odine	Variable in its action; 3 grains have been fatal.	Acrid taste, tightness about the throat, vomiting.	Vomiting should be encouraged and gruel, arrowroot and starch given freely.
	Ether	When inhaled.	Effects similar to chloroform.	Cold affusion and artificial respiration.
	Pyrogallol	2 grains sufficient to kill a dog.	Resembles phosphorus poisoning.	No certain remedy. Speedy emetic desirable.

ORTHOCHROMATIC DATA.

DISTRIBUTION OF THE COLOURS IN THE SPECTRUM.

(ACCORDING TO LISTING.)

Colour		Wave length.
BROWN ..	Limit ..	819·8
	Middle ..	768·6
RED.. ..	Limit ..	723·4
	Middle ..	683·2
ORANGE ..	Limit ..	647·2
	Middle ..	614·9
YELLOW ..	Limit ..	585·6
	Middle ..	559·0
GREEN ..	Limit ..	534·7
	Middle ..	512·4
CYAN BLUE..	Limit ..	491·9
	Middle ..	473·0
INDIGO ..	Limit ..	455·5
	Middle ..	439·2
VIOLET ..	Limit ..	424·0
	Middle ..	409·9
LAVENDER ..	Limit ..	396·7
	Middle ..	384·3
	Limit ..	372·6

WAVE LENGTHS OF BRIGHT LINES OF ELEMENTS USED IN PLOTTING OUT THE SPECTRUM.

(IN TEN-MILLIONTHS OF A MILLIMETRE ANGSTROM UNITS.)

TABLE I.

Name of line.	Colour.	Salts used.	Wave lengths = λ
Lithium	Red	Lithium chloride or nitrate ..	6705
Lithium	Orange	Lithium chloride or nitrate ..	6102
D	Orange	Sodium chloride or bicarbonate	5893
"Little b"	Green	Magnesium ribbon	5183
Strontium	Blue	Strontium chloride or metal ..	4607
Calcium	Blue	Calcium nitrate or chloride ..	4227
Potassium	Violet	Potassium chloride	4080

Table I. has been drawn up so as to enable any one with nothing more than an ordinary Bunsen gas burner to construct a chart, by means of which the position of any Fraunhofer line in the spectrum may be determined with sufficient accuracy for all photographic purposes. The salts should be dissolved in distilled water so as to form a saturated solution, a narrow loop of copper or iron wire should be wound with fibrous asbestos, and this repeatedly heated in the Bunsen and allowed to cool.

TABLE II.

C	Red	Hydrogen tube	6563
"Little b"	Green	Magnesium rod	5183
F	Bluish-green	Hydrogen tube	4861
Magnesium	Blue	Magnesium rod	4481
G	Blue	Hydrogen tube	4308
"Little h"	Blue	Hydrogen tube	4102

Table II. will give the data, most easily obtained if a small induction coil is used. A small coil, giving a fat ½ or ¾ in. spark, and actuated by three bichromate bottles will suffice to show the lines in this table. The hydrogen tube is, of course, of the well-known Plucker or Salet form. The magnesium may be used in twisted spirals of ribbon, but preferably in rod form, and the rods should be filed to comparatively sharp points. The constricted portion of the vacuum tube and the points of the magnesium rod should be placed parallel to and not at right angles to the slit.

EXPOSURE TABLES.

The following table, based on that of Burton, gives a rough idea of the exposures for various subjects and diaphragms under the following conditions:—

1. Best lighting; midday sunshine in May, June, and July.
2. With the most rapid commercial plates. See below for factors applying to other conditions.

F/ No.	Average Subject with objects in Foreground. Street Scenes. Outdoor Figure Studies.	Landscapes with Light Foreground, Lake, River, and Beach Scenes.	Sea Clouds and Sky.	Subjects with Extra Heavy Foreground, *e.g.*, Dark Trees, Doorways, Groups.	Under Trees, Woods, Avenues, Glades, etc.	Portrait in Average Well-lighted Room.
f/4	1/250	1/500	—	1/120	1/20	1/8
f/4·5	1/200	1/400	—	1/100	1/15	1/7
f/5·6	1/130	1/250	—	1/64	1/10	1/4
f/6·3	1/100	1/200	1/1000	1/50	1/8	1/3
f/7	1/80	1/150	1/800	1/40	1/7	2/5
f/8	1/64	1/120	1/600	1/30	1/5	1/2
f/11	1/30	1/60	1/300	1/15	1/2	1
f/16	1/15	1/30	1/150	1/8	1	2
f/22	1/8	1/15	1/80	1/4	2	4
f/32	1/4	1/8	1/40	1/2	4	8
f/45	1/2	1/4	1/20	1	8	16
f/64	1	1/2	1/10	2	16	30

In weather other than bright sunshine the above exposures are multiplied as follows :—

Bright diffused light, the sun behind a cloud	× 1½	Heavy clouds over the whole sky. Absence of distinct shadows ..	× 3
Light clouds over the whole sky, but light able to cast a visible shadow	× 2	Very dull. Whole sky covered by still heavier clouds	× 4 to 5

At other hours of the day and times of the year the above exposures are multiplied by the numbers in the following table of daylight variation. The figure 1 in the table indicates times for which the above exposures are correct.

VARIATION IN DAYLIGHT FROM MORNING UNTIL EVENING (FOR LATITUDE OF BRITISH ISLES, NORTH GERMANY, ETC).

	Morning.								
	12	11	10	9	8	7	6	5	4
January ..	3½	4	5	12					
February ..	2	2½	3	4	10				
March	1½	1½	1¾	2	3	6			
April	1¼	1¼	1¼	1½	2	3	6		
May	1	1	1	1¼	1½	2½	3	6	
June	1	1	1	1	1½	2	2½	5	12
July	1	1	1	1¼	1½	2½	3	6	
August	1¼	1¼	1¼	1½	2	3	6		
September ..	1½	1½	1¾	2	3	6			
October.. ..	2	2½	3	4	10				
November ..	3½	4	5	12					
December ..	4½	5	6						
	12	1	2	3	4	5	6	7	8
	Afternoon.								

PINHOLE EXPOSURES.

(WATKINS-POWER NUMBERS.*)

W.P. No.	Diameter.		Nearest Needle Size.	Good Working Distance.
	Inch.	Inch.		Inches.
1	0·160	$\frac{1}{7}$	—	—
2	0·080	$\frac{1}{13}$	—	—
3	0·053	$\frac{1}{10}$	1	40
4	0·040	$\frac{1}{25}$	4	20
5	0·032	$\frac{1}{31}$	5	14
6	0·027	$\frac{1}{38}$	7	10
7	0·023	$\frac{1}{44}$	8	8
8	0·020	$\frac{1}{52}$	10	5

Rule for use of W.P. No. in Column 1.—Multiply W.P. No. of aperture by its working distance from plate. Use the result as the f/No. in calculating exposure by meter, tables or other means. Whatever the calculated result is in seconds or fractions of a second, expose that number of minutes or fractions of a minute. Example.—W.P. 6 at 8 inches calculate as f/48.

* The principle of this system will be understood from a consideration of an example of focal aperture:—A $\frac{1}{4}$-inch aperture at 9 inches = f/36 If every second on the actinometer is to be reckoned a minute, the aperture must be one-sixtieth the *area*, that is the diameter must be divided by $\sqrt{60}$ or, near enough, by $\sqrt{64} = 8$. Therefore, an aperture of $\frac{1}{4} \div 8 = \frac{1}{32}$ inch diameter = f/36 when minutes are given instead of seconds. Therefore, reasoning backwards, a pinhole of $\frac{1}{32}$-inch diameter is called No. 4 ($32 \div 8$). Similarly one of half the diameter is No 8, and so on. Mr. Watkins, in order to allow for the exposure in excess of the theoretical which is needed in pinhole photography, calculates minutes as seconds at $\frac{1}{40}$ instead of $\frac{1}{60}$, the *area* of aperture, and therefore his so-called W.P. (Watkins-Power number) is obtained by dividing the denominator of the fraction which expresses the diameter of the pinhole by 6·3 instead of 8. Thus, in the case of a $\frac{1}{38}$-diameter hole, $38 \div 6{\cdot}3 = 6{\cdot}2$, or, near enough, W.P. No. is 6.

TABLE OF COMPARATIVE PLATE SPEED NUMBERS.

H & D.	Watkins P. No.	Wynne F. No.	H & D.	Watkins P. No.	Wynne F. No.
10	15	24	220	323	114
20	30	28	240	352	120
40	60	49	260	382	124
80	120	69	280	412	129
100	147	77	300	441	134
120	176	84	320	470	138
140	206	91	340	500	142
160	235	103	380	558	150
200	294	109	400	588	154

The above Watkins and Wynne numbers are equivalent to the H and D, only when the latter is determined in accordance with the directions of Hurter and Driffield, that is with pyro-soda developer and using the straight portion only of the density curve.

To convert H and D into Watkins:—Multiply H and D by 50 and divide by 34. For all practical purposes the Watkins P number is 1½ times H and D.

To convert Watkins into Wynne F. Nos. :—Extract the square root and multiply by 6·4.

The above methods have been approved by the Watkins Meter Company and the Infallible Exposure Meter Company with reference to "Wratten" plates, but the comparisons here given may not hold good with every other plate.

SHUTTER SPEEDS FOR MOVING OBJECTS.

From the "Wellcome Exposure Record and Diary."

The formula and table given below indicate the shutter speeds necessary to secure negatives sufficiently sharp for direct printing. For enlarging it is better to give ½ to ⅓ these exposures, or to work further from the object. *The figures are no guide to what is the correct exposure for the plate.*

If D = distance of object in feet, F = focal length of lens, S = speed of object in feet per second, and E = exposure for an object moving across the field of view, then

$$E = \frac{D}{100\, F \times S}$$

The following table gives in round figures the shutter speeds necessary for various moving objects, using the ordinary quarter plate lens of about 5 in. focus. The column A is for objects moving directly towards the operator, B for objects moving obliquely towards or from the camera, that marked C for objects moving directly across the field of view.

Distance of Object, 25 ft., unless otherwise stated.	A.	B.	C.
Street groups (no rapid motion)		1/5 to 1/10	
Pedestrians (two miles per hour) .. / Animals grazing	1/20	1/40	1/60
Pedestrians (three miles per hour) ..	1/30	1/60	1/90
Pedestrians (four miles per hour).. ..	1/40	1/80	1/120
Vehicles (six miles per hour)	1/60	1/120	1/180
Vehicles (eight miles per hour)	1/80	1/150	1/250
Cyclists and trotting horses	1/160	1/300	1/500
Foot races and sports	1/240	1/500	1/700
Divers	—	1/600	1/800
Cycle races, horse galloping	1/300	1/750	1/900
Yachts (10 knots per hour) at 50 ft. ..	1/60	1/120	1/180
Steamers (20 knots per hour) at 50 ft. ..	1/120	1/240	1/360
Trains (30 miles per hour) at 50 ft. ..	1/150	1/300	1/450
Trains (60 miles per hour) at 50 ft. ..	1/300	1/600	1/900

At 50 ft. the exposure may be double that at 25 ft.
At 100 ft. the exposure may be double that at 50 ft.

OPTICAL CALCULATIONS.

FINDING THE FOCAL LENGTH OF A LENS.

As simple and accurate a method as any is first to focus the lens on an object at an infinite distance (see table on page 898), and to mark the position of any convenient part of the moving lens front on the fixed camera baseboard, then place any object such as a foot rule before the camera, and focus—by moving only (1) camera as a whole and (2) camera front on baseboard, not back of camera—until image on screen is same size as original. The distance through which the camera front has to be moved to secure this is the focal length of the lens, and is indicated by the separation of the mark on the fixed baseboard from that on the lens front in its final (same-size) position.

FOCAL DISTANCES WHEN COPYING ON A REDUCED SCALE.

When reducing an original x times (linear), distance from original to lens is found by *multiplying* focal length of lens by x and adding one focal length.

Example.—Reducing 12 in. to 4 in. (reduction of 3 linear) with 6 in. lens, distance from original to lens is $6 \times 3 + 6 = 24$ in.

Distance from lens to plate is found by *dividing* focal length by x and adding one focal length.

Thus (conditions as above) $6 \div 3 + 6 = 8$ in.

FOCAL DISTANCES WHEN ENLARGING WITH CAMERA OR LANTERN.

When enlarging a negative x times (linear), distance from negative to lens is found by *dividing* focal length of lens by x and adding one focal length.

Example.—4 inches in negative to 16 inches in enlargement, that is x equals 4. With lens of 8 inch focus, distance from lens to negative is $8 \div 4 + 8 = 10$ in.

Distance from lens to sensitive paper or plate is found by *multiplying* focal length of lens by x and adding one focal length.

Thus (conditions as above) $8 \times 4 + 8 = 40$ in.

"CONJUGATES" AND "EXTRA FOCAL" DISTANCES."

The full distances: (1) lens to plate, and (2) lens to original, are called the "conjugate focal lengths."

Imagine a solid bar projecting in front of and behind the lens to a distance in each case equal to the focal length of the lens. The distances from opposite ends of the imaginary bar to the original and plate respectively are the "extra focal distances" (E.F.D.). They are the conjugates less one focal length.

MENTAL LENS CALCULATIONS.

By using the "extra focal distances" lens calculations become much more readily done in the head, remembering that:—

When copying or enlarging, say, 4 times, the greater "extra focal distance" is four times the focal length of the lens, and the smaller "extra focal distance" one-fourth the focal length of the lens. Similarly for a 5-times reduction or enlargement, the greater E.F.D. is five times the focal length; the smaller, one-fifth the focal length.

By adding one focal length to each of these E.F.D.'s we get the actual distances from plate and original to lens.

STUDIO CALCULATIONS.

(*By the E.F.D. Method.*)

To calculate what length of studio is necessary for work of a given kind with a given lens, it is convenient to take the height of the average sitter as:—

Full length standing .... 68 inches
Head and shoulders .... 30 inches

When making portraits in the sizes of prints in common use, the degrees of reduction are those given in the following table:—

Name and Size of Photograph.	C. de V.	Cabinet.	Boudoir.*	Imperial.†
Height of image on photograph	3	5	7½	9
For full-length portrait, reduction figure is	23	13	9	7½
For head and shoulders portrait, reduction figure is	10	6	4	3 nearly

* 8½ × 5¼. † 10 × 6⅞.

These few figures and the E.F.D. rule given above are all that is required for the ordinary studio calculations.

Thus we want to know what descriptions of work can be done, say, in a studio 18 ft. long with a 10 in. lens, that is we want to find the reduction figure possible in these conditions.

In all calculations of studio working space 6 ft ought to be subtracted from the wall-to-wall length. The sitter will usually be 3 ft. in front of the back wall, and the photographer wants about the same space behind the camera

Therefore, working space is 12 ft. – 144 in.

Subtracting 2 focal lengths (20 inches), the space for the two E.F.D.'s is 124 ins. As the smaller E.F.D. is only an inch or so (a fraction of the focal length), it is near enough to take this 124 ins. as the front E.F.D. Dividing it by the focal length,

$$124 \div 10 = 12\tfrac{1}{2},$$

we get the reduction figure, showing that the greatest reduction we can get is not quite enough for full length cabinets.

Similar studio calculations are readily made, bearing in mind that the total wall-to-wall length is parcelled out thus:—

E.F D. towards object (large).
E.F.D. towards image (small).
Two focal lengths.
Space for sitter and operator (6 ft.).

Remember, too, that the object E.F.D. is equal to the focal length × the reduction figure, whilst the image E F.D is the focal length ÷ the reduction figure, and is, therefore, never more than an inch or two at the most.

SHORTENING AND INCREASING THE FOCAL LENGTH OF A LENS.

The rule (very rough, on account of the impossibility of knowing from which part of a lens-mount to measure) for finding the focal length of an extra lens, to reduce or increase the focal length of a given lens, is:—

Multiply the focal length to be altered by the final focal length desired, and divide the product by the original focal length less the final focal length.

That is: $f_2 = \dfrac{f_1 \times F}{f_1 - F}$

where f_1 is the original focal length,
F the final focal length required,
and f_2 the focal length of the necessary added lens.

To increase the focal length use a negative lens.
To reduce the focal length use a positive lens.

MAGNIFIERS.

When using a supplementary lens (magnifier) as a means of bringing near objects into focus, the focal length of the supplementary lens must be equal to the distance of the object. This holds good whatever the focal length of the original lens.

TELEPHOTO CALCULATIONS.

F = equivalent focal length of complete lens.
f_1 = equivalent focal length of positive.
f_2 = equivalent focal length of negative.
E = camera extension, from negative lens to ground glass.
M = magnification, that is number of times the image given by the complete lens is larger than that given by positive alone.

Magnification when working at given extension is found by dividing camera extension by focal length of negative lens and adding 1.

$$M = \frac{E}{f_2} + 1.$$

Camera extension, necessary for given magnification—multiply focal length of negative lens by magnification less 1.

$$E = f_2\,(M-1)$$

Focal length of complete lens.—Multiply focal length of positive by magnification.

STEREOSCOPIC FACTS AND FIGURES.

To secure correct conditions of convergency each print must be seen under the same angle of view as that at which it was produced, and the two prints must be mounted in accord with the following rules :—

Let P = separation of any pair of corresponding points on prints.
N = separation of same points on negatives.
E = separation of eyes (average is 64 mm.).
L = separation of camera lenses.

A non-prismatic stereoscope being used :—

1. If image points represent infinitely distant objects, make $P = E$.

2. If only near objects are shown and an ordinary single plate double lens stereo camera has been used

Make $P = E + L - N$.

3. If a single camera is used for two separate exposures, or if two separate similar cameras are used together, measure N with negatives placed edge to edge and in the same relative positions that they occupied during exposure, and then

Make $P = E - N +$ length of one plate.

If a prismatic stereoscope, fitted with properly centred half lenses is used, add the width of one prism to above values of P.

DIAPHRAGM NUMBERS.

EQUIVALENT F/· AND UNIFORM SYSTEM NUMBERS.

Rel. Exposure Req'd..	1	2	4	8	16	32	64	128
F Nos.	4	5·6	8	11·3	16	22·6	32	45·2
U.S. Nos.	1	2	4	8	16	32	64	128

NOTE.—Most lenses are now marked with the f/ numbers, although the U.S. numbers are used on Kodak lenses. Also the actual diameter of the diaphragm aperture in millimetres is marked on Zeiss lenses, such as the "Convertible."

APPROXIMATE INFINITY FOR LENSES OF VARIOUS FOCAL LENGTHS.

By C. Welborne Piper, from "The First Book of the Lens."

FOCAL LENGTH, INCHES.	DISTANCE OF FOCUSSING-SCREEN BEHIND PRINCIPAL FOCUS.			
	$\frac{1}{100}$ in.	$\frac{1}{250}$ in.	$\frac{1}{500}$ in.	$\frac{1}{1000}$ in.
1	3 yds.	7½ yds.	15 yds.	30 yds.
2	11 ,,	28 ,,	55 ,,	110 ,,
3	25 ,,	63 ,,	125 ,,	250 ,
4	45 ,,	113 ,,	225 ,,	450 ,,
5	70 ,,	175 ,,	350 ,,	700 ,,
6	100 ,,	250 ,,	500 ,,	1000 ,,
7	136 ,,	340 ,,	680 ,,	1360 ,,
8	178 ,,	¼ mile	½ mile	1 mile
9¾	264 ,,	660 yds.	¾ ,,	1½ miles
11¼	351 ,,	½ mile	1 ,,	2 ,,
12½	434 ,,	1085 yds.	1¼ miles	2½ ,,
13¾	525 ,,	¾ mile	1½ ,,	3 ,,
16	700 ,,	1 ,,	2 ,,	4 ,,
17¾	875 ,,	1¼ miles	2½ ,,	5 ,,
19½	1056 ,,	1½ ,,	3 ,,	6 ,,
21	1225 ,,	1¾ ,,	3½ ,,	7 ,,
22½	1406 ,,	2 ,,	4 ,,	8 ,,
24	1600 ,,	2¼ ,,	4½ ,,	9 ,,
25	1 mile	2½ ,,	5 ,,	10 ,,
28	1¼ miles	3¼ ,,	6½ ,,	13 ,,
30	1½ ,,	3¾ ,,	7½ ,,	15 ,,
33	1¾ ,,	4½ ,,	9 ,,	18 ,,
35	2 ,,	5 ,,	10 ,,	20 ,,

By focussing accurately on distances not less than those given, we ensure that the focussing-screen is within $\frac{1}{100}$, $\frac{1}{250}$, $\frac{1}{500}$, or, $\frac{1}{1000}$ in from the true principal focus.

DISTANCES WHEN ENLARGING AND REDUCING.

Focus of Lens, inches	TIMES OF ENLARGEMENT AND REDUCTION.							
	1	2	3	4	5	6	7	8
	inches	inches	inches	inches	inches	inches	inches	inches
3	6 6	9 4½	12 4	15 3¾	18 3⅗	21 3½	24 3 3/7	27 3⅜
3½	7 7	10½ 5¼	14 4⅔	17½ 4⅜	21 4⅕	24½ 4 1/12	28 4	31½ 3 15/16
4	8 8	12 6	16 5⅓	20 5	24 4⅘	28 4⅔	32 4 4/7	36 4½
4½	9 9	13½ 6¾	18 6	22½ 5⅝	27 5⅖	31½ 5¼	36 5 1/7	40½ 5 1/16
5	10 10	15 7½	20 6⅔	25 6¼	30 6	35 5⅚	40 5 5/7	45 5⅝
5½	11 11	16½ 8¼	22 7⅓	27½ 6⅞	33 6⅗	38½ 6 5/12	44 6 2/7	49½ 6 3/16
6	12 12	18 9	24 8	30 7½	36 7⅕	42 7	48 6 6/7	54 6¾
7	14 14	21 10½	28 9⅓	35 8¾	42 8⅖	49 8⅙	56 8	63 7⅞
8	16 16	24 12	32 10⅔	40 10	48 9⅗	56 9⅓	64 9 1/7	72 9
9	18 18	27 13½	36 12	45 11¼	54 10⅘	63 10½	72 10 2/7	81 10⅛
10	20 20	30 15	40 13⅓	50 12½	60 12	70 11⅔	80 11 3/7	90 11¼
11	22 22	33 16½	44 14⅔	55 13¾	66 13⅕	77 12⅚	88 12 4/7	99 12⅜
12	24 24	36 18	48 16	60 15	72 14⅖	84 14	96 13 5/7	108 13½

The table is used as follows:—Knowing the focal length of the lens to be used and the degree of (linear) enlargement or reduction, look up the figure for enlargement or reduction in the upper horizontal row, and carry the eye down the column below it until it reaches the horizontal line of figures opposite the focal length of lens in the left-hand column.

When *enlarging*, the greater of the two distances where the two lines join is the distance from lens to the sensitive paper or plate. The lesser is the distance from lens to negative, or picture being enlarged direct in camera.

When *reducing*, the distances are *vice-versâ*: the greater is the distance from lens to original, the smaller from lens to sensitive plate.

RELATIVE EXPOSURES WHEN ENLARGING (WITHOUT A CONDENSER).

New Times of Enlargement.	Times of enlargement for which exposure is known.											
	1	1½	2	2½	3	3½	4	5	6	8	10	12
1	1	⅔	⅖	⅓	¼	⅕	⅙	1/9	1/12	1/25	1/30	[illegible]
1½	1½	1	¾	½	⅖	⅓	¼	⅙	⅛	1/12	1/20	1/30
2	2¼	1½	1	¾	⅗	⅖	⅓	¼	⅕	1/9	1/12	1/20
2½	3	2	1¼	1	¾	⅗	½	⅓	¼	⅙	1/10	1/15
3	4	2½	1⅘	1¼	1	¾	⅔	⅖	⅓	⅕	⅛	1/11
3½	5	3½	2¼	1¾	1¼	1	⅘	½	⅖	¼	⅙	1/9
4	6	4	3	2	1½	1¼	1	¾	½	⅓	⅕	1/7
5	9	6	4	3	2¼	1¾	1½	1	¾	⅖	⅓	⅕
6	12	8	5	4	3	2½	2	1¼	1	⅗	⅖	2/7
8	20	13	9	7	5	4	3½	2¼	1¾	1	⅔	½
10	30	19	13	10	7	6	5	3½	2½	1½	1	¾
12	42	27	19	14	11	8	7	4½	3½	2	1½	1

To use this table find in the top horizontal line the number of times of enlargement for which exposure is known. Under this number the relative time of exposure for different degrees of enlargement will be found opposite the new times of enlargement in first vertical column.

RELATIVE EXPOSURES WHEN COPYING OR REDUCING.

New Scales of Reduction.	Scale of reduction for which exposure is known.											
	1	¾	⅔	½	⅓	¼	⅕	⅙	⅛	1/10	1/20	1/30
1	1	1¼	1½	1¾	2¼	2½	3	3	3	3½	3½	3½
¾	¾	1	1 1/10	1¼	1¾	2	2	2¼	2½	2½	3	3
⅔	¾	⅞	1	1¼	1½	1¾	2	2	2¼	2¼	2½	2½
½	⅗	¾	⅘	1	1¼	1½	1½	1¾	2	2	2	2
⅓	⅖	⅗	⅔	⅘	1	1⅙	1¼	1¼	1½	1½	1½	1¾
¼	⅖	½	⅗	¾	⅞	1	1	1⅛	1¼	1¼	1½	1½
⅕	⅖	½	½	⅔	⅘	1	1	1	1⅙	1⅕	1¼	1¼
⅙	⅓	⅖	½	⅔	¾	⅞	1	1	1	1⅛	1⅕	1¼
⅛	⅓	⅖	⅖	⅗	¾	⅘	⅞	1	1	1	1 1/10	1⅛
1/10	⅓	⅖	⅖	½	⅔	¾	⅘	⅞	1	1	1	1⅙
1/20	2/7	⅖	⅖	½	⅔	¾	⅘	⅞	1	1	1	1
1/30	¼	⅜	⅖	½	⅗	¾	¾	⅞	⅞	⅞	1	1

To use this table find in the top horizontal line the scale of reduction for which exposure is known. Under this scale the relative time of exposure for different degrees of reduction will be found opposite the new scales of reduction marked in first vertical column.

TABLE OF VIEW-ANGLES.

DIVIDE THE BASE* OF THE PLATE BY THE EQUIVALENT FOCUS OF THE LENS.

If the quotient is	The angle is	If the quotient is	The angle is	If the quotient is	The angle is
	Degrees.		Degrees.		Degrees.
0·282	16	0·748	41	1·3	66
0·3	17	0·768	42	1·32	67
0·317	18	0·788	43	1·36	68
0·335	19	0·808	44	1·375	69
0·353	20	0·828	45	1·4	70
0·37	21	0·849	46	1·427	71
0·389	22	0·87	47	1·45	72
0·407	23	0·89	48	1·48	73
0·425	24	0·911	49	1·5	74
0·443	25	0·933	50	1·53	75
0·462	26	0·954	51	1·56	76
0·48	27	0·975	52	1·59	77
0·5	28	1·0	53	1·62	78
0·517	29	1·02	54	1·649	79
0·536	30	1·041	55	1·678	80
0·555	31	1·063	56	1·7	81
0·573	32	1·086	57	1·739	82
0·592	33	1·108	58	1·769	83
0·611	34	1·132	59	1·8	84
0·631	35	1·155	60	1·833	85
0·65	36	1·178	61	1·865	86
0·67	37	1·2	62	1·898	87
0·689	38	1·225	63	1·931	88
0·708	39	1·25	64	1·965	89
0·728	40	1·274	65	2·0	90

Example.—Given a lens of 13 inches equivalent focus; required the angle included by it on plate 3¼ × 4¼.

Diagonal is 5·3 inches. 5·3 ÷ 13 = ·407, corresponding with angle of 23°.

* More accurately the diagonal of the plate, inasmuch as the field of the lens is circular, and if the corners of the plate are to be covered the angle embraced by the lens should be sufficient to cover the diagonal of the plate. The maker of a lens stated to cover up to a given angle may be asked if that angle is measured on the length or diagonal of a plate.

The lengths of the diagonals of the plates most commonly used are :—

3¼ × 3¼	diagonal 4·6 inches.	7½ × 5	diagonal 9·0 inches.
3¼ × 4¼	„ 5·3 „	6½ × 8½	„ 10·7 „
5 × 4	„ 6·4 „	10 × 8	„ 12·8 „
4¾ × 6½	„	12 × 10	„ 15·6 „
7 × 5	„	15 × 12	„ 19·2 „

E. M. NELSON'S TABLE OF DISTANCES FOR LANTERN PROJECTION.

Distance of Projection Lens from Screen, Mask being Three Inches.

Foci	4½		5		5½		6		7		8		9		10		11		12	14		15		16		18	
Disc.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	ft.	in.	ft.	in.	ft.	in.	ft.	in.
5	7	10½	8	9	9	7½	10	6	12	3	14	0	15	9	17	6	19	3	21	24	6	26	3	28	0	31	6
6	9	4½	10	5	11	5½	12	6	14	7	16	8	18	9	20	10	22	11	25	29	2	31	3	33	4	37	6
7	10	10½	12	1	13	3½	14	6	16	11	19	4	21	9	24	2	26	7	29	33	10	36	3	38	8	43	6
8	12	4½	13	9	15	1½	16	6	19	3	22	0	24	9	27	6	30	3	33	38	6	41	3	44	0	49	6
9	13	10½	15	5	16	11½	18	6	21	7	24	8	27	9	30	10	33	11	37	43	2	46	3	49	4	55	6
10	15	4½	17	1	18	9½	20	6	23	11	27	4	30	9	34	2	37	7	41	47	10	51	3	54	8	61	6
11	16	10½	18	9	20	7½	22	6	26	3	30	0	33	9	37	6	41	3	45	52	6	56	3	60	0	67	6
12	18	4½	20	5	22	5½	24	6	28	7	32	8	36	9	40	10	44	11	49	57	2	61	3	65	4	73	6
13	19	10½	22	1	24	3½	26	6	30	11	35	4	39	9	44	2	48	7	53	61	10	66	3	70	8	79	6
14	21	4½	23	9	26	1½	28	6	33	3	38	0	42	9	47	6	52	3	57	66	6	71	3	76	0	85	6
15	22	10½	25	5	27	11½	30	6	35	7	40	8	45	9	50	10	55	11	61	71	2	76	3	81	4	91	6
16	24	4½	27	1	29	9½	32	6	37	11	43	4	48	9	54	2	59	7	65	75	10	81	3	86	8	97	6
18	27	4½	30	5	33	5½	36	6	42	7	48	8	54	9	60	10	66	11	73	85	2	91	3	97	4	109	6
20	30	4½	33	9	37	1½	40	6	47	3	54	0	60	9	67	6	74	3	81	94	6	101	3	108	0	121	6
25	37	10½	42	1	46	3½	50	6	58	11	67	4	75	9	84	2	92	7	101	117	10	126	3	134	8	151	6
30	45	4½	50	5	55	5½	60	6	70	7	80	8	90	9	100	10	110	11	121	141	2	151	[illegible]	161	4	181	6
35	52	10½	58	9	64	7½	70	6	82	3	94	0	105	0	117	6	129	3	141	164	6	[illegible]	3	188	0	211	6
40	60	4½	67	1	73	9½	80	6	93	11	107	4	120	9	134	2	147	7	161	187	10	[illegible]	3	214	8	241	6
45	67	10½	75	5	82	11½	90	6	105	7	120	8	135	9	150	10	165	11	181	211	2	[illegible]	3	241	4	271	6
50	75	4½	83	9	92	1½	100	6	117	3	134	0	150	9	167	6	184	3	201	234	6	[illegible]	3	268	0	301	6

TABLES OF DISTANCES AT AND BEYOND WHICH ALL OBJECTS ARE IN FOCUS WHEN SHARP FOCUS IS SECURED ON INFINITY.

Focal length of Lens in inches.	Ratio marked on Stops.													
	f/4	f/5.6	f/6	f/7	f/8	f/10	f/11	f/15	f/16	f/20	f/22	f/32	f/44	f/64
	Number of feet after which all is in focus.													
4	33	24	22	19	17	13	12	9	8	7	6	4	3	2
4¼	38	27	25	21	19	15	14	10	10	7	7	5	3½	2½
4½	42	30	28	24	21	17	15	11	11	8½	7½	5½	4	3
4¾	47	34	31	27	24	19	17	12	12	9½	8½	6	5	3
5	52	36	35	30	26	21	19	14	13	10½	9½	6½	5½	3½
5¼	57	40	38	33	28	23	21	15	14	11½	10½	7	5½	3½
5½	63	45	43	36	31	25	23	17	15	12½	11½	7½	6	4
5¾	68	50	46	38	34	27	25	18	17	13½	13	8½	6½	4
6	75	54	50	42	38	30	28	20	19	15	14	9	7	4½
6¼	81	58	54	46	40	32	29	22	20	16	15	10	7½	5
6½	87	62	58	50	44	35	32	23	22	17½	16	11	8	5½
6¾	94	67	63	54	47	38	34	25	24	19	17	12	8½	6
7	101	72	68	58	51	40	37	27	25	20	18	12½	9	6
7¼	109	78	73	62	54	44	39	29	27	22	20	13½	10	6½
7½	117	83	78	64	58	47	42	31	29	24	21	14½	10½	7
7¾	124	90	83	71	62	50	45	33	31	25	22	15½	11	7½
8	132	96	88	76	68	52	48	36	32	28	24	16	12	8
8¼	141	100	94	80	71	56	51	37	35	29	25	17½	12½	8½
8½	150	104	100	84	76	60	56	40	38	30	27	19	13½	9
8¾	156	111	104	89	78	63	57	42	39	32	29	20	14	10
9	168	120	112	96	84	67	61	45	42	34	31	21	15	10½
9¼	180	127	116	101	90	71	65	47	45	35	32	22	16	11
9½	190	133	125	107	95	75	68	50	47	37	34	24	17	12
9¾	197	141	131	113	99	79	72	52	50	39	36	25	18	12½
10	208	148	140	120	104	83	75	55	52	42	38	26	19	13

If sharp focus is secured on any of the distances shown, then, with the stop indicated, all objects are in focus from half the distance focussed on up to infinity.

TABLE OF DISTANCES FOR AN OBJECT OF SIXTY-EIGHT INCHES HEIGHT.

Computed by P. Brosig.

Equivalent Focus (inches)	Heights of Images (inches).																
	1	2	3	4	6	8	10	12	14	16	20	24	28	32	40	48	56	68
2	138·0 2·0	70·0 2·1	47·3 2·1	36·0 2·1														
3	207·0 3·0	105·0 3·1	71·0 3·1	54·0 3·2	37·0 3·3													
4	276·0 4·1	140·0 4·1	94·7 4·2	72·0 4·2	49·3 4·4	38·0 4·5												
5	345·0 5·1	175·0 5·1	118·3 5·2	90·0 5·3	61·7 5·4	47·5 5·6	39·0 5·7											
6	414·0 6·1	210·0 6·2	142·0 6·3	108·0 6·4	74·0 6·5	57·0 6·7	46·8 6·9	40·0 7·1	35·1 7·2									
7	483·0 7·0	245·0 7·1	165·7 7·3	126·0 7·4	86·3 7·6	66·5 7·8	54·6 8·0	46·7 8·2	41·0 8·4	36·7 8·6								
8	552·0 8·1	280·0 8·2	189·3 8·4	144·0 8·5	98·7 8·7	76·0 8·9	62·4 9·2	53·3 9·4	46·9 9·6	42·0 9·9	35·2 10·4							
9	621·0 9·1	315·0 9·3	213·0 9·4	162·0 9·5	111·0 9·8	85·5 10·1	70·2 10·3	60·0 10·6	52·7 10·9	47·2 11·1	39·6 11·6							
10	690·0 10·1	350·0 10·3	236·7 10·4	180·0 10·6	123·3 10·9	95·0 11·2	78·0 11·5	66·7 11·8	58·6 12·1	52·5 12·4	44·0 12·9	38·3 13·5	34·3 14·1					
11	759·0 11·2	385·0 11·3	260·3 11·5	198·0 11·6	135·7 12·0	104·5 12·3	85·8 12·6	73·3 12·9	64·4 13·3	57·7 13·6	48·4 14·2	42·2 14·9	37·7 15·5	34·4 16·2				
12	828·0 12·2	420·0 12·4	284·0 12·5	216·0 12·7	148·0 13·1	114·0 13·4	93·6 13·8	80·0 14·1	70·3 14·5	63·0 14·8	52·8 15·5	46·0 16·2	41·1 16·9	37·5 17·6				
1[illegible]	897·0 13·2	455·0 13·4	307·7 13·6	234·0 13·8	160·3 14·1	123·5 14·5	101·4 14·9	86·7 15·3	76·1 15·7	68·2 16·1	57·2 16·8	49·8 17·6	44·6 18·4	40·6 19·1	3[illegible]·1 [illegible]·6			

Values are omitted here on account of the wide angle of space required. (More than ninety degrees.)

[illegible]	[illegible] 14·2	490·0 14·4	331·3 14·6	252·0 14·8	172·7 15·2	133·0 15·6	109·2 16·1	93·3 16·5	82·0 16·9	73·5 17·3	61·6 18·0	53·7 18·9	48·0 19·8	43·7 20·6	[illegible]7·8 [illegible]·2			
16	1104 16·2	560·0 16·5	378·7 16·7	288·0 16·9	197·3 17·4	152·0 17·9	124·8 18·4	106·7 18·8	93·7 19·3	84·0 19·8	70·4 20·7	61·3 21·6	54·9 22·6	50·0 23·5	45·2 25·[illegible]	38·7 27·3	35·4 29·2	
18	1242 18·3	630·0 18·5	426·0 18·8	324·0 19·1	222·0 19·6	171·0 20·1	140·4 20·6	120·0 21·2	105·4 21·7	94·5 22·2	79·2 23·3	69·0 24·4	61·7 25·4	56·2 26·5	48·[illegible] 28·[illegible]	43·5 30·7	39·9 32·8	36·0 36·0
20	1380 20·3	700·0 20·6	473·3 20·9	360·0 21·2	246·7 21·8	199·0 22·4	156·0 22·9	133·3 23·5	117·1 24·1	105·0 24·7	88·0 25·9	76·7 27·1	68·6 28·2	62·5 29·4	54·[illegible] 31·8	[illegible] 34·1	44·3 36·5	40·0 40·0
22	1518 22·3	770·0 22·6	520·7 23·0	396·0 23·3	271·3 23·9	209·0 24·6	171·6 25·2	146·7 25·9	128·9 26·5	115·5 27·2	96·8 28·5	84·3 29·8	75·4 31·1	68·7 32·4	59·4 35·9	53·2 37·6	48·7 40·1	44·0 44·0
24	1656 24·4	840·0 24·7	568·0 25·1	432·0 25·4	296·0 26·1	228·0 26·8	187·2 27·5	160·0 28·2	140·6 28·9	126·0 29·6	105·6 31·1	92·0 32·5	82·3 33·9	75·0 35·3	64·8 38·1	58·0 40·9	53·1 43·8	48·0 48·0
26	1794 26·4	910·0 26·8	615·3 27·1	468·0 27·5	320·6 28·3	247·0 29·0	202·8 29·8	173·3 30·6	152·3 31·3	136·5 32·1	114·4 33·6	99·7 35·2	89·1 36·7	81·2 38·2	70·2 41·3	62·8 44·4	57·6 47·4	52·0 52·0
28	1932 28·4	980·0 28·8	662·7 29·2	504·0 29·6	345·3 30·5	266·0 31·3	218·4 32·1	186·7 32·9	164·0 33·8	147·0 34·6	123·2 36·2	107·3 37·9	96·0 39·5	87·5 41·2	75·6 44·5	67·7 47·8	62·0 51·1	56·0 56·0
32	2208 32·5	1120 32·9	757·3 33·4	576·0 33·9	394·7 34·8	304·0 35·8	249·6 36·7	213·3 37·6	187·4 38·6	168·0 39·5	140·8 41·4	122·7 43·3	109·7 45·2	100·0 47·1	86·4 50·8	77·3 54·6	70·9 58·4	64·0 64·0
36	2484 36·5	1260 37·1	852·0 37·6	648·0 38·1	444·0 39·2	342·0 40·2	280·8 41·3	240·0 42·4	210·9 43·4	189·0 44·5	158·4 46·5	138·0 48·7	123·4 50·8	112·5 52·9	97·2 57·2	87·0 61·4	79·7 65·6	72·0 72·0
44	3036 44·6	1540 45·3	1041 45·9	792·0 46·7	542·7 47·9	418·0 49·2	343·2 50·5	293·3 51·8	257·7 53·1	231·0 54·3	193·6 56·9	168·7 59·6	150·9 62·1	137·5 64·7	118·8 69·9	106·3 75·1	97·4 80·2	88·0 88·0
52	3588 52·8	1820 53·5	1231 54·3	936·0 55·1	641·3 56·6	494·0 58·1	405·6 59·6	346·7 61·2	304·6 62·7	273·0 64·2	228·8 67·3	199·3 70·4	178·3 73·4	162·5 76·5	140·4 82·6	125·7 88·7	115·1 94·8	104·0 104·0

This table gives, in inches, the distances from lens to object (greater conjugate focus, upper number) and from lens to ground glass (lesser conjugate focus, lower number) for different heights of images and different lengths of foci of lenses, when the height of object is 68 inches (=average height of man).

EXAMPLES.

Q.—What is the height of image of a person who is 133 inches distance from lens, when a lens of 14 inches focus is used?

A.—The height of image in this case is 8 inches.

Q.—What are the distances between object, lens, and ground glass if the image of a person is to be 8 inches high and a 14 inches focus lens is employed?

A.—The distance from object to lens will be 133 inches, from lens to ground glass 15·6 inches.

TABLES IN PAST ISSUES OF THE ALMANAC.

The following is a list of tables which have appeared in past issues o the "Almanac," but are not included among those in the present volume The reference in brackets after each is to the most recent issue of th "Almanac" in which the table has appeared; in most cases it will b found included for several years prior to the date of this reference.

Chemical Tables.

Weights and Measures Act. ["B.J.A." 1905, p. 1012.]

Simplification of Emulsion Calculations. (Equivalents of Alkalin Haloid Salts.) ["B.J.A." 1903, p. 1160.]

Solubility of the Silver Haloids—Valenta. ["B.J.A." 1907, p. 1109.]

Freezing Mixtures. ["B.J.A." 1907, p. 1116.]

Chemical Equivalence of the Alkalies. ["B.J.A." 1903, p. 1159.]

Developing Equivalence of the Alkalies. ["B.J.A." 1903, p. 1159.]

Chemical Reactions of the known Developing Agents (Tests o Developers). ["B.J.A." 1904, p. 1010.]

Pyro Developers recommended for various Plates by Makers. ["B.J.A. 1890, p. 666.]

Orthochromatic Data.

Speeds and Colour Sensitiveness of Various Plates to Different Lights —Eder. ["B.J.A." 1907, p. 1115.]

Wave-Lengths of the Principal Fraunhofer Spectrum Lines, and th Elements that give them. ["B.J.A." 1905, p. 1144.]

Reflection of Light from various surfaces. ["B.J.A." 1900, p. 1016.]

Light and Exposure.

Hourly Variation in the Sun's Position in Degrees from the South a Different Seasons of the Year.—J. A. C. Branfil. ["B.J.A." 1903, p. 1176

Points of the Compass at which the Sun rises for London, Edinburgh and Dublin. ["B.J.A." 1869, p. 147.]

Sun's Altitude for various Latitudes. ["B.J.A." 1898, p. 1063.]

Exposure and Lens Aperture. ["B.J.A." 1910, p. 893.]

Actinograph Exposure Table. ["B.J.A." 1901, p. 702.]

Comparative Exposures.—W. K. Burton. ["B.J.A." 1887, p. 341.]

Comparative Exposures.—Dr. Scott. ["B.J.A." 1887, p. 432.]

Displacement on Ground Glass of Objects in Motion. ["B.J.A." 1903, p. 1180.]

Optical Tables.

Equations relating to Foci, etc.—Branfil. ["B.J.A." 1907, p. 1120.]

Depth of Field.—Formulæ. ["B.J.A." 1910, p. 894.]

Combining Lenses.—Formulæ. ["B.J.A." 1910, p. 893.]

Perspective—Factors. ["B.J.A." 1910, p. 895.]

Correction of Convergent Distortion.—Formulæ. ["B.J.A." 1910, p. 896.

Scale of Image.—Formulæ. ["B.J.A." 1910, p. 893.]

Conjugate Foci.—Formulæ. ["B.J.A." 1910, p. 892.]

Minimum Length of Studio for a given Lens. ["B.J.A." 1905, p. 998

Royal Photographic Society's Standard Diaphragms. ["B.J.A." 190: p. 1178; 1905, p. 1149; and 1907, p. 1093.]

"Uniform System" Numbers for Stops from f/1 to f/100. ["B.J.A. 1905, p. 1147.]

Continental Stops and their U.S. Equivalents. ["B.J.A." 1907, p. 1127.

Correction for Inconstancy of Aperture—Formulæ. ["B.J.A." 1910, p 895

Angles and Foci of the Tele-Photo Lens. ["B.J.A." 1894, p. 919.]

Steinheil's Table of Camera Extensions, Equivalent Foci and Diamete of Images corresponding to a given Magnification of the Tele-Phot graphic Lens. ["B.J.A." 1902, p. 732.]

Focussing with Pinhole Apertures. ["B.J.A." 1896, p. 954.]